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A GEOGRAPHICAL EXAMINATION OF THE DEVELOPMENT OF SCOTTISH RAILWAYS

NEWBIGIN MEMORIAL ESSAY, 1938

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By the mid-Victorian era railways were regarded as the acme of perfection as a means of transport. Modern agents have rivalled the iron road for both speed and convenience, but nevertheless it frequently holds its own where passengers and goods in bulk have to be conveyed for considerable distances; thus in a developed area such as Scotland a consideration of railways still involves discussion of the principal resources of the country. Relief, mineral workings, agriculture, fisheries and the distribution of population, together with other geographical factors, have all helped to control railway construction, and these factors in their turn were, and are, influenced by the railways. Some attempt has been made in this essay to demonstrate the interplay of the factors, and illustrations have been taken from both the building and the working of the lines.

As in England, the earliest railways were the primitive tramroads constructed by colliery proprietors to link up with water transport—either sea or canal. One of the earliest was one from Alloa, and we read that "In 1768, a waggon way was made to the Alloa pits [from the coast], which proved to be so great an advantage that it induced the proprietor to extend it to Collyland in 1771."[1] Primitive as it appears to have been, from contemporary descriptions, this horse-drawn tramway increased sales by 50 per cent. Another early railway was that from Kilmarnock to Troon, completed in 1810 by the Duke of Portland to serve his Troon collieries. For many years worked by horses, after an experiment with the locomotive in 1817, it carried annually 70,000 tons of coal as well as timber, lime, grain, slates, and some passengers. The Monkland and Kirkintilloch Railway, opened in 1826, linked the Monkland collieries with the Forth and Clyde Canal, and so rapidly did traffic increase that horses were soon replaced by

steam locomotives. Table A demonstrates how the early railways, with the solitary exception of the Dundee and Newtyle, were all associated with the coalfields.

The strongly marked relief of Scotland dictated the major lines of communication and one of the most vigorous early expositions may be quoted here : " One of the great roads from England must obviously enter by the east coast, and the other by Carlisle. We may suppose the former continued through the middle of East Lothian to Edinburgh ; thence through Linlithgowshire to Stirling, after sending off a branch to Glasgow ; from Stirling along the Allan and the Earn to Perth ; and thence by the coast to Dundee, Montrose and Aberdeen. From Perth, however, a branch scarcely less important than the main trunk might be carried through the fertile valley of Strathmore in the line marked out by Mr. Stevenson.[3] The course of the Tweed will afford a separate line into Midlothian, and perhaps into Lanarkshire. The most advantageous line for the western main trunk would probably be from Carlisle to Dumfries ; thence along the valley of the Nith into Ayrshire (the summit being only about 500 feet above the sea, with an ascent remarkably regular) ; and by Ayr, Irvine and Paisley, to Glasgow. A branch line would, of course, run along the coast to Wigtown and Stranraer. It is not improbable, that by rails of a cheaper kind—perhaps of wood, like those first used at Newcastle—the benefits of this improvement may even be extended to the Highlands, which are penetrated to a great depth at various points by valleys, often deviating very little from a horizontal level." [4] As will be seen from Fig. 1, it was fifty years before these main lines, so strongly controlled by physical features, were completed.

By the end of the first quarter of the nineteenth century railways had passed from their first stage, in which they were subsidiary to canals, into the second, as rivals ; and tracks laid to feed a canal became extended in order to compete with it. In surveys made by prospective railway companies stress was laid on the trade carried by the canal routes to be paralleled. Thus the Edinburgh and Glasgow Railway noted that the Forth and Clyde Canal carried nearly 40,000 tons of grain from the Lothians to Glasgow, in addition to that carted by road. This was a traffic they confidently expected to acquire.[5]

As the first diagram demonstrates, by the close of 1840 the railways had outgrown the four original centres of the Lanarkshire, Ayrshire and Midlothian coalfields and the rich agricultural hinterland of Dundee. Ten years later three railways had crossed the

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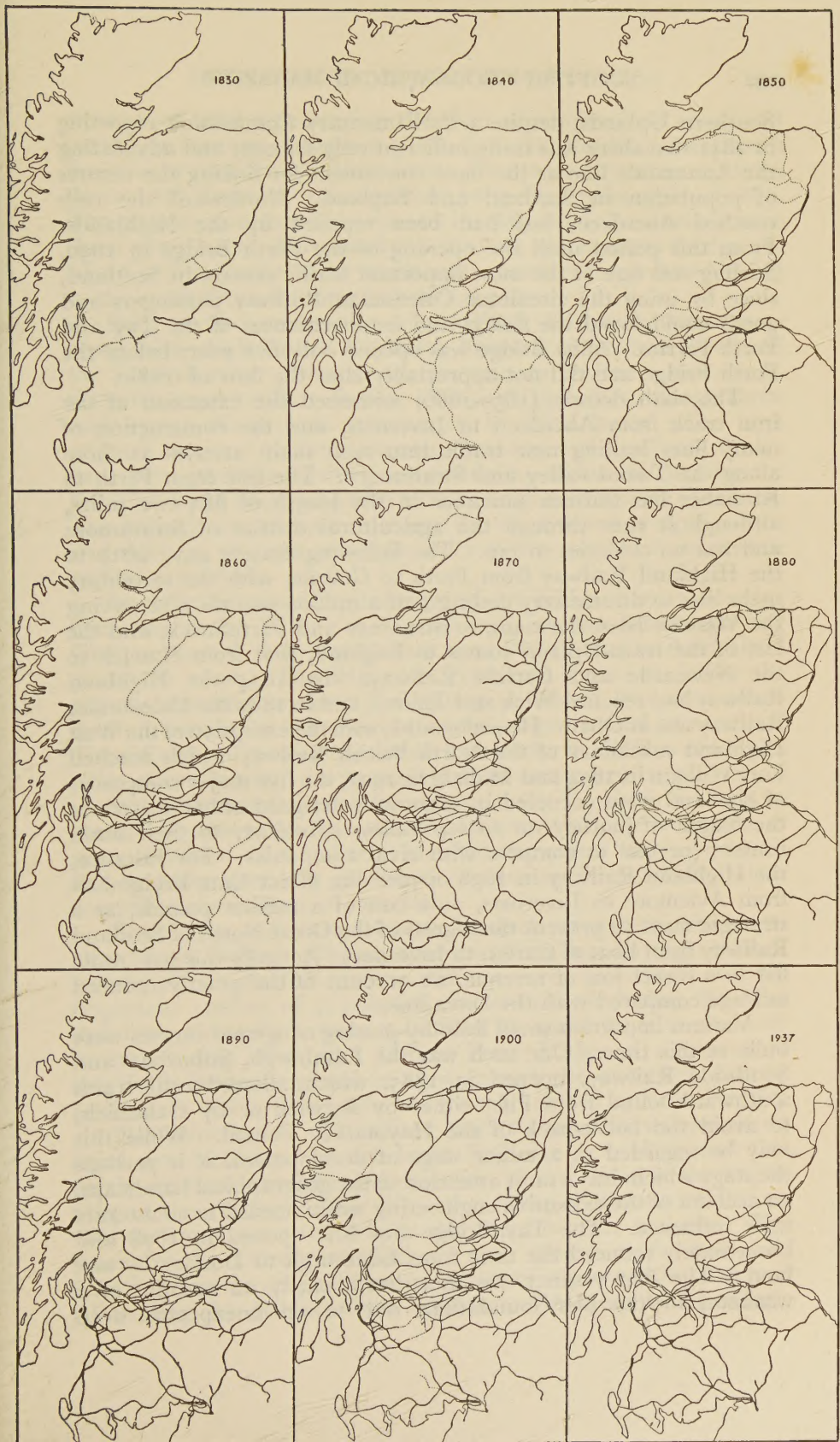
FIG. 1 (opposite). Growth of railways in Scotland by decades. Solid lines represent the position on December 31st of the year indicated, dotted lines those tracks built in the succeeding ten years. For 1937 only those lines on which passenger services were in operation are shown.


1830
1840
1850
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1937

Southern Uplands, despite a Parliamentary Commission reporting in 1841 that there was trade sufficient only for one, and advocating the Annandale line as the most convenient for linking the centres of population in Scotland and England. Northward the rails reached Aberdeen, but had been repelled by the Highlands. From this period until the opening of the Forth Bridge in 1890, Stirling was one of the most important traffic centres in Scotland, since by using the circuitous Caledonian Railway passengers and goods could avoid the delays and inconveniences of the Tay and Forth Ferries. Alloa Bridge was opened only five years before the Forth Bridge and did not appreciably alter the flow of traffic.

The sixth decade (1850-1860) witnessed the extension of the iron track from Aberdeen to Inverness, and the construction of many lines leading new traffic into such main arteries as those along the Tweed valley and Strathmore. The line from Perth to Kinnaber has thirteen junctions in the length of fifty-two miles, although it runs through the agricultural district of Strathmore and has no collieries to tap. The following decade gave birth to the Highland Railway from Perth to Golspie, with the secondary main line to Stromeferry costing half a million pounds and serving the Western Isles, the route to Stranraer and Portpatrick, and the last of the trans-Upland routes to England, that from Hawick to the Newcastle and Carlisle Railway. By 1874 the Highland Railway had reached Wick and Thurso, and in 1880 the Caledonian Railway was at Oban. Henceforward, with the exception of the West Highland subsidiary of the North British Railway which reached Fort William in 1894 and Mallaig in 1901, the five major companies of Scotland were occupied in extensions designed either to reduce the length of journey, or to tap valleys subsidiary to their main routes ; or else to compete with rival companies. For instance, the Highland Railway in 1898 opened the direct Carr Bridge line from Aviemore to Inverness, at a cost of a million pounds, as a strategic move to prevent the ingress of the Great North of Scotland Railway from Boat of Garten to Inverness. Actually this new route led to a direct loss of revenue, on account of the greatly reduced mileage compared with the Dava line.

Various important small links by-passing congested centres were built at this time. One such was the Edinburgh, Suburban and Southside Railway, opened in 1885, which allowed coal trains southward-bound from Fife, either by Berwick or by Galashiels, to avoid the bottle-neck of the Haymarket Tunnel. While this may be regarded as a minor stage of development, it is perhaps the stage which draws most attention to the geographical handicaps, on account of the expensive engineering works needed to counteract their influence. The Tay Bridge was first opened in 1878 and immediately reduced the time from Edinburgh to Dundee by one hour. The first viaduct was short-lived, partly on account of a weakness in the pier foundations due to an unexpected deep

channel of mud representing the path of a proto-Tay river, and partly on account of neglect of the fact that the funnel nature of the estuary concentrates wind force. The central spans were blown down with dramatic consequences by a December gale of 1879. The present structure was opened in 1887, and the Forth Bridge three years later. Fortunately in the case of the latter bridge the island of Inchgarvie to the north and a patch of tough boulder-clay to the south formed strong foundation points.

Prior to the construction of the Forth Bridge the constituent companies which formed the North British Railway had purchased the Forth Ferries. Even in the pre-railway era there was a considerable cross traffic. During 1881, 13,154 horses, 18,057 cattle and 25,151 sheep were transported by ferry boats. The high original cost and heavy maintenance charges of the Forth Bridge have been justified by the great shortening of the distance for the East Coast and Midland routes from London to the North (Table B). The railways are allowed to charge for the distance bridged (about one mile) as nineteen miles, in order to recompense them for the capital expended.

In order to gain full advantage of the bridge three connecting lines had to be built : to Winchburgh, on the Edinburgh and Glasgow route ; to Bridge of Earn near Perth ; and to Burntisland along the coast. The link with Perth was forced to follow the narrow, winding confines of Glenfarg in which, if a short intermediate cutting be ignored, occurs the longest tunnel in Scotland. The difficulty of crossing the Ochils here is seen by the five-and-a-half miles of continuous 1-in-75 grade against southward-bound trains.

With the completion of the railway across the Forth the railway trucks—17,000 a month—which had previously been ferried at once increased in number. In 1898, however, there were still 84,500 passengers who preferred to use the ferry which statute compelled the railway to maintain.

The flimsy, mile-long Solway Viaduct, opened in 1870, was closed from 1881 to 1884 on account of ice floes having removed several piers. As this viaduct did not serve to connect directly important centres of population, it was closed during the War and later dismantled, since it fulfilled no useful function and was in urgent need of repair. Connel Ferry Bridge—a miniature of the Forth Bridge—opened in 1903, crosses the narrowest part of Loch Etive and has been adapted for road as well as for rail traffic.

The construction of auxiliary lines to serve thinly populated areas was facilitated by the Light Railways Act, 1896, and this partly accounts for the rapid extension of such lines at the beginning of the century (Table C). A number of branches failed to take an important part, despite the hopes of their builders. The detour of the Caledonian Railway from Glamis to Fordoun fell, from fulfilling the original concept of it as an important thoroughfare (shortening the distance from London to Aberdeen by 8¾ miles),

to the status of a local line to Brechin. Others again, such as the Lauder Light Railway, serving towns by roundabout routes, crossed bare pastoral uplands which could produce no traffic for a railway, and had in addition to face competition from more direct public roads. Fortunately the development of motor transport after the War was so rapid that the recommendation of the Committee of the Secretary of State for Scotland in 1918—that 382 miles of light railways should be constructed to stimulate agriculture—failed to get beyond the stage of a report.

The confining effect of hills in Scotland is epitomised at Bowling.

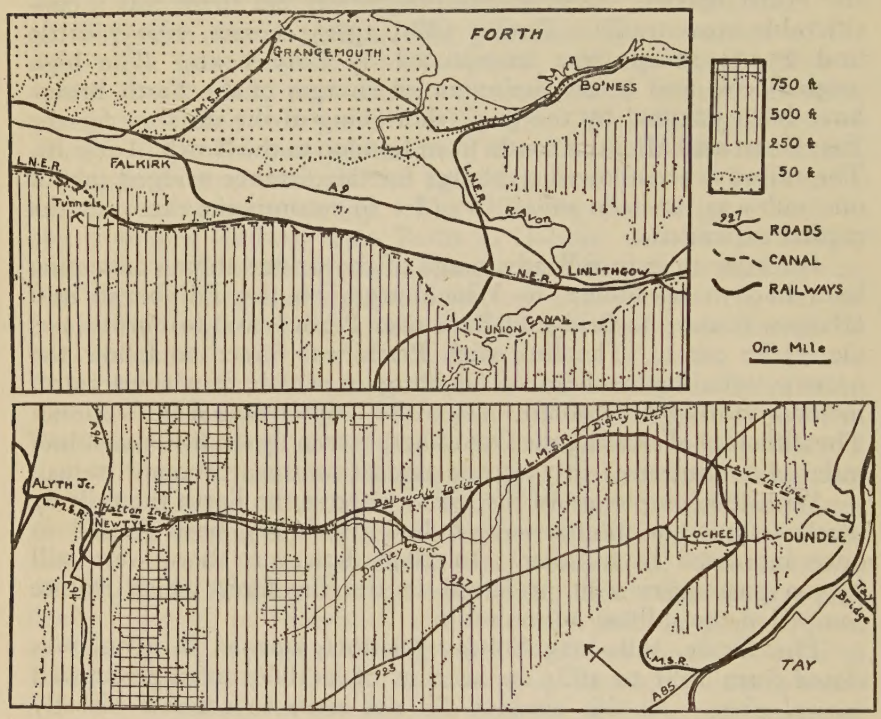


FIG. 2. Examples of local relief control.

The Clyde, the Lanarkshire and Dumbarton line, the Forth and Clyde Canal and the main road (on all of which the L.M. & S. Railway has an interest in transport services), are so close together that they can be photographed in one picture.[6] From a multitude of other examples, two may be selected as conspicuous. Fig. 2 (*a*) shows the alignment of the Edinburgh and Glasgow Railway, the Union Canal and the main road between Linlithgow and Falkirk. The Carse lands are approximately indicated by the stippled area. The canal curves up the Avon valley, thereby needing no locks at an altitude of 240 feet; while the railway preserves almost as horizontal a course (Fig. 3), crossing the valley more directly,

but only at the expense of half a mile of embankment and a viaduct three-eighths of a mile long. The uneven profile of the direct road is due to the hummocky surface of the boulder-clay virtually unmodified by cuttings or embankments. A possible route for this railway was surveyed along the edge of the Forth, but was rejected by George Stephenson on account of the numerous indentations. He rejected also a line along the landward edge of the Carse, since it cut through landed property.

Fig. 2 (*b*) illustrates how topographical control may interfere with the working of a line by locomotives. The original alignment of the old Dundee and Newtyle Railway is shown to have been more direct than the present route, but was forced to have three inclined planes (Law Incline 1-in-10, Balbeuchly Incline 1-in-25,

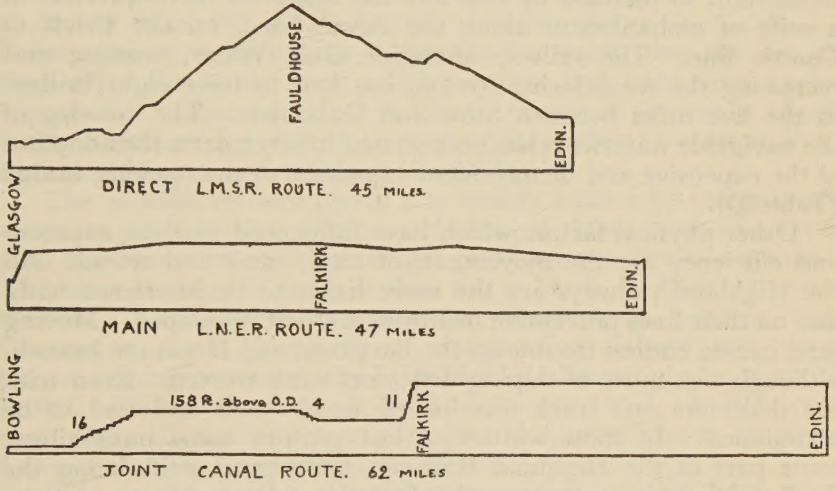


Fig. 3. Profiles of main railway lines and of the canal between Edinburgh and Glasgow. (Vertical scale given by height on canal profile.)

and Hatton Incline 1-in-15) which necessitated steam-operated ropes to haul up the wagons. These inclines, proving an obstacle to traffic, were replaced during 1860-61 by the more regularly graded but considerably more circuitous route via Lochee, after which the line could be worked by locomotives throughout. An incline with ropes was also used through Cowlairs Tunnel, at the Glasgow end of the Glasgow and Edinburgh Railway. Locomotives were tried soon after the opening in 1842, but on account of the damage done by vibration to adjacent buildings, rope working, at an annual cost of £5000, was utilised until 1909. The rope-operated Scotland Street Tunnel in Edinburgh was abandoned (later to be utilised for growing mushrooms) when the circuitous but more convenient Abbeyhill line to Leith was opened in 1869.

Unfortunately in the case of many trunk lines an uneven profile had to be accepted where the routes crossed watersheds. A train

on the main line of the L.M. & S. Railway from Glasgow to Aberdeen is successively at the following altitudes : Cumbernauld 327 feet, Alloa Junction 58 feet, Plean 133 feet, Bridge of Allan 26 feet, Blackford 422 feet, Perth 20 feet, Forfar 227 feet, Bridge of Dun 14 feet, Drumlithie 355 feet ; and finally enters Aberdeen station only 17 feet above sea-level. Uneven as these figures reveal the profile to be, the summits were made as low as they are only at the expense of a winding course which takes every advantage of cols and gaps.

The U-shaped glacial valleys of the Highlands and Southern Uplands proved useful as routeways, but the railways had to be kept above the flood-plains. In 1903, for example, ten years after its construction, the Caledonian Railway was obliged by repeated inundation to increase by two feet the height of three-quarters of a mile of embankment along the River Earn, on the Crieff to Comrie line. The railway alongside Gala Water, crossing and recrossing the meandering stream, has had to have eight bridges in the five miles between Stow and Galashiels. The crossing of the navigable waterways has necessitated in seven cases the adoption of the expensive and inconvenient expedient of the opening bridge (Table D).

Other physical factors which have influenced working expenses and efficiency are the movements of sand, snow and stones. All the Highland railways are the more liable to be interfered with, and on their lines preventive measures are best developed. Moving sand caused endless trouble on the Burghead and Hopeman branch, although two miles of sloping deflectors were erected. Even with the deflectors one track was buried under sand and had to be abandoned. In most winters of last century snow immobilised some part of the Highland Railway, the biggest drift being the 60 feet of snow over an engine-funnel on Dava Moor. In the winter of 1894-95 every line, except the coastal stretch from Inverness to Helmsdale, was closed for some time. South of Wick fish trains were snowed up, but the fish, by the very cause of the delay, was preserved and sold in London some days later. At the close of last century the doubling of the line near Dalnaspidal, with the consequent widening of the cuttings giving room for the snow-ploughs to work, reduced the snow menace. On Rannoch Moor the West Highland line has the only snowshed on a British railway. Rock falls are a cause of increased maintenance charges on the Callander and Oban section, where the track hugs scree-strewn hillsides. Safety is secured by trap wires which put the signals at danger if rocks fall on the rails.

The major regional divisions of Scotland can readily be distinguished on a map of the railways. The Southern Uplands have cross routes, the Central Lowlands an intricate mesh of interwoven lines, the North-East has numerous branch lines all focussing on Aberdeen, and in the Highlands the only railways are main lines.

The Highland railways, on account of the paucity of traffic, were built with the minimum of large engineering works. The West Highland Railway reached its terminus, Mallaig, requiring only one tunnel—and that a mere 20 yards bore near Loch Lomond. The line between Bridge of Orchy and Rannoch has a true horse-shoe curve up the valley of Alt Chonoghlais to avoid building a viaduct, and between Corpach and Kinlochiel it avoids gradients by clinging to the shore under the lee of the sea-walls. The paucity of traffic is revealed by the distance between stations : fifteen miles between Bridge of Orchy and Rannoch stations, and seventeen and a half from Rannoch to Tulloch, if lonely Corrour Halt, recently made public, be ignored.

With increasing lengths of line and faster trains the populous areas became more closely linked. The most impressive example is drawn from the Anglo-Scottish services shown in Table E. Local services were just as important for quickening the life of Scotland. Previously local country routes had been very badly organised : " Thus a resident in Huntly cannot at present [*c.* 1850] reach Aberdeen [41 miles] by any of the ordinary conveyances, transact business, and return the same day." [7]

The Scottish railway plexus was mainly formed by fusing small elements, and, lacking original cohesion, it shows anomalies even after the reduction of the principal companies to two in number.[8] The most striking of these is that the L.M. & S. Railway main services to the North use, between Gartsherrie Junction and Garnqueen South Junction, 52 chains of a railway now used by the owning company, the L. & N.E. Railway, only for mineral traffic. Neither the L.M. & S. Railway nor the L. & N.E. can run trucks all the way from Glasgow to Grangemouth, or from Larbert to Alloa, over their own metals.

Even in the period of railway expansion, certain lines were closed as unprofitable. The Findhorn Railway from Kinloss was closed in 1869, and it was said that the branch was a failure on account of a sand-bar forming across the harbour entrance so that even fishing boats could not enter. Before considering where lines have been abandoned in recent years, however, it is useful to examine Figs. 4 and 5, which show the flow of passenger and goods trains along the network. These diagrams, constructed from the working time-tables, indicate approximately the regular week-day services operated in 1937. The present depressed state of trade is revealed in the goods and mineral train time-tables, where against many trains appears the intimation : " Suspended until further notice."

Fig. 4, by the thickness of the line, demonstrates the flow of passenger trains along the Scottish railway system. Round Glasgow, with its intricate mesh of lines and varied services, many of high frequency running from one loop to another, there has had to be some simplification, but with the first analysis of the working

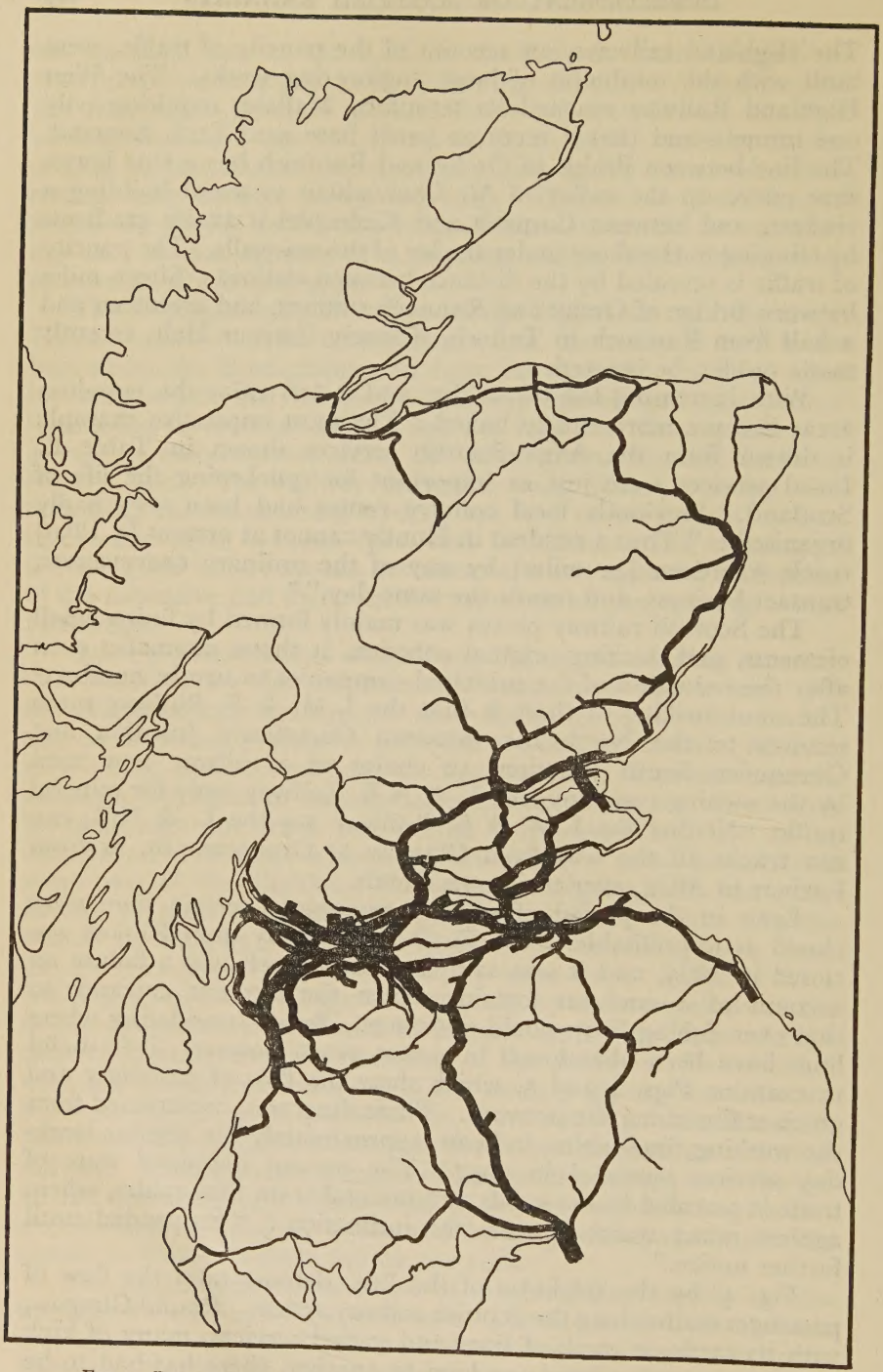


FIG. 4. Passenger train services in Scotland, summer 1937. The thickness of the line is proportional to the number of trains using it.

time-tables on to a base map of the scale of 4 miles to 1 inch all routes were fully examined. The Highlands have two particularly interesting features : the increasing flow of traffic towards Aberdeen, and the reduction in the number of trains crossing Druimuachdar Summit on the Highland Railway as compared with those which reach Aviemore and Blair Atholl. In the Central Lowlands, where there is at first sight a medley of lines, these can be sorted out into definite routeways. In the northern portion the routes are dominated by the relief controls, and the gaps, with the exception of that between the Campsie and Kilpatrick Hills which leads to no important town, are daily threaded by many trains. From Edinburgh to Glasgow one line stands out as of far greater importance than its shorter, but more heavily graded, rivals. The Clyde Valley dictates the trend of the lines, and on either bank down the estuary as far as Gourock and Helensburgh there is an intensive service ; but southwards the trunk line to Carlisle is by far the most important. From Glasgow westwards there are a number of lines, all of which are utilised considerably for passenger trains, and connect either with the intensive north-south services from Ayr to Largs or else with the Nithsdale route to the South.

The Southern Heights of the Central Lowlands permit, in addition to the crossing of the Anglo-Scottish lines, a limited number of east-west lines ; but these, crossing pastoral lands, have a scanty passenger traffic. The railway pattern of the Southern Uplands is dominated by the north-south lines which follow the east coast ; Gala Water and the Teviot ; the Clyde and Annan ; the Nith ; and the Stinchar and Luce rivers. Of these it is interesting to note that the Annandale line, recommended as the best by the Parliamentary Commission Report of 1841, now carries the heaviest passenger, and goods, services. Apart from the main trend there is a limited number of cross routes, of which the principal two are those along the Tweed Valley and the transverse route of the south-west to Stranraer ; which, passing as it does from Annandale successively into the drainage areas of the Nith, the Urr, the Dee, the Fleet, the Cree, the Badenoch and the Luce within seventy miles, is badly graded for express traffic, of which it carries little despite the importance of the short sea journey to Ireland. Apart from these main lines the Southern Uplands have a number of short connecting routes to towns situated in valleys secondary to those which control the major railways. Jedburgh, Selkirk, Langholm, Moniaive, Wanlockhead, Moffat, Kirkcudbright and Wigtown, three of which are county towns, are all served by such side lines.

While there is a marked flow of traffic from one large town to another, there are in addition passenger facilities which have led to the net result demonstrated in Fig. 4. First as regards suburban traffic, the most intensive service, and that which, unless special factors operate, has been most hard hit by omnibus com-

petition, is developed round each of the four big cities. Edinburgh has the Corstorphine and Balerno branches, each with about twenty trains a day. The Balerno line, winding as it does along the narrow confines of the Water of Leith, is not paralleled for its whole length by roads and is considerably quicker than road transport, which may account for its survival. Centres served by tram, omnibus and rail tend to have passenger services on the rail only during rush periods, as in the case of the Leith stations.

Glasgow has two kinds of residential traffic : the local, which operates over the Underground and Circle lines, serves factory and other workers and provides a valuable cross-Glasgow transport agency ; and the long distance, principally to coastal dormitory towns. The G. & S.W. Railway, ignoring the local traffic near Glasgow, concentrated on providing fast trains to groups of towns in Ayrshire, and they were helped in this policy by the multiple routes constructed from Glasgow to Paisley and Ayrshire. The 41½ miles to Ayr was covered in fifty minutes before the War. It proved a fortunate policy, as this is the traffic least hit by rival transport services. The Caledonian Railway also provided long-distance residential trains, such as the " Upper Ward Express," which served as far as Moffat, and the " Strathallan and Ben Ledi Express."

Dundee railways developed Broughty Ferry as a residential area for wealthier persons, only to lose the traffic to road vehicles. Newport and Tayport across the river from Dundee, while they could also be served by ferry, became dormitory areas only when they were linked to Dundee by the Tay Bridge. Incidentally one of the handicaps to the earlier growth of Newport was the lack of water, and advantage was taken of the opening of the bridge to pipe water across from Lintrathen. For many years Aberdeen had a remarkable suburban traffic development in the closely placed stations and the intensive service of trains on both the Culter and Dyce lines. In 1937 this suburban traffic was abandoned by the railway owing to omnibus competition ; the road vehicles passing directly through the centres of villages were more convenient and this outweighed the greater speed by train.

In addition to suburban traffic the railways also rely, particularly in upland regions, on tourist traffic, a trade they were responsible for developing if not for creating. In association with the tourist traffic is that to the shooting estates of the North, and the Highland Railway, particularly in the last century, was the focus for this transport. The congestion on the single line from Perth was responsible for many delays. The southern companies concentrated vehicles at Perth ; for example, in August 1888 a train of thirty-six coaches, belonging to nine companies, left this station for the North.[9] Although the line was so congested in the sporting season, the Highland Railway by careful working succeeded in avoiding serious accidents from this cause ; the worst disaster

occurring to a passenger train in June 1914 when a cloudburst in Speyside proved too much for a culvert and a passenger train was swept to destruction. The Caledonian Railway also developed a tourist traffic, and in 1912 introduced on the Ballachulish extension rail-cars with seats in tiers, char-à-banc fashion. In the Central Lowlands tourist traffic was first developed on the Troon and Kilmarnock Railway, where in 1817 Dupin says : " I saw some diligences established on the iron railway from Kilmarnock to Troon." [10] Thus the weavers of Kilmarnock were enabled to travel to the Firth of Clyde.

The introduction of the motor car soon made its influence felt on railway revenues, particularly in the Highlands where the immediate effect was to diminish the volume of first-class traffic. " The more extensive use of the motor car by visitors from the south is making serious inroads into the receipts of the Highland Railway from first-class fares. A large number of people who used to visit the Highlands by train, and travelled first-class, have during the present year [1904] arrived in the Highlands by motor car, and have moved about the country by the same means, instead of taking train and travelling first-class from station to station as they used to do." [11] Other railways were able, by powers in their Acts, to develop the rival for their own ends. The Great North of Scotland Railway in 1921 had in operation the services displayed in Table F.

In the post-war period the railways, with parliamentary assent in 1928, purchased shares in certain omnibus companies, and after careful examination of the traffic position on branch railways they closed those that were unremunerative. Many miles of track had been built under the stimulus of inter-company rivalry, and it may fairly be said that those built on an unsound geographical or economic footing have been closed, or else maintain a goods service which is usually of daily frequency but may be weekly, as in the case of the Fort Augustus line. As E. A. Pratt has shown,[12] when railways bought canals, rival companies were able to tap the industrial works situated near the canal and the purchasing company was at a disadvantage.

The road services are of two categories : the route which leads traffic to the railway, and the direct rival. The Highlands best show the former type, with the long road routes from the west coast down to the railway, thus carrying on the tradition of the Great North of Scotland Railway. The rival routes are most powerful when the rail goes by a winding path through the hills, as in the case of the Lauder Light Railway, whilst the road climbs directly over the nearest pass, in this case Soutra Hill. It is significant that many of the abandonments are in the case of lines of recent construction which were built into areas of sparse population. In the development of the rail mesh the mining and industrial areas, seeking a port outlet, offered the greatest

inducement to capital: the Caledonian Railway in 1887 was paying a dividend of 7½ per cent. when the Great North of Scotland Railway was paying only 3 per cent. Once built, these railways still further developed the industrialisation of the Central Lowlands, draining off the population of the uplands to help supply labour demands. The Midlothian coalfield sent by the North British Railway 1·3 million tons of coal in 1900, which rose to 3·2 million tons in 1909. The coalfield was unable to develop without the railway and the increase of output in its turn aided the railway to expand. The Highland railways are of later genesis and, often built by large grants from the landowners, there was little they could develop save the fisheries, distilleries, sheep and tourist industries—all of which are highly seasonal occupations. Commonly the building of a railway gave a temporary fillip to local industries, for the supply of building and ballasting material, but that it did not necessarily follow is seen from the case of the Edinburgh Water Works Railway from Broughton by Talla Water. Built for carrying Carluke clay to puddle the reservoir, it used granite from Della Casa quarry in Italy for its Tweed Bridge, on account of its being cheaper than that from Aberdeen or Cornwall.

Fig. 5, compiled in the same way as Fig. 4, shows the running of goods trains in Scotland, and much the same effect of regional control is seen, the main difference being that the Central Lowlands have a still greater domination over the upland regions. As well as the goods trains mapped, there are others in special categories. Fish trains run from the Moray Firth (via Aviemore and Aberdeen), Oban, Wemyss and Stranraer to the South by Carlisle and Berwick. The northern lines acquired a considerable fish traffic during the War, when fishing in the southern North Sea was impossible, and thus in 1918, 27,499 tons of herrings and 21,510 tons of white fish passed through Aberdeen, as against 15,497 and 9235 tons respectively in 1920.[14] Special livestock and meat trains run from Aberdeenshire to London. Within Scotland special livestock trains are run from surrounding districts into the principal markets, such as Stirling and Gorgie (Edinburgh). One interesting traffic which owes its existence to the railway is the "milk special" from Wamphray, in Dumfriesshire, to Newcastle-on-Tyne. The working time-tables also reveal features of interest, for example, that trains will call at remote spots in order to carry children to school, that the engine driver one day a week will carry a can of drinking water for an isolated platelayer's home, or that a train will be run to carry church-goers.

The railways in some cases obtained the control of docks and harbours and spent freely in order to develop them. Grangemouth, as purchased in 1867, had 7¾ acres of water as against the present 165, and the trade handled has greatly increased. The North British Railway acquired the Methil Docks from the Wemyss family in 1889, and increased the coal exports from 0·4 million

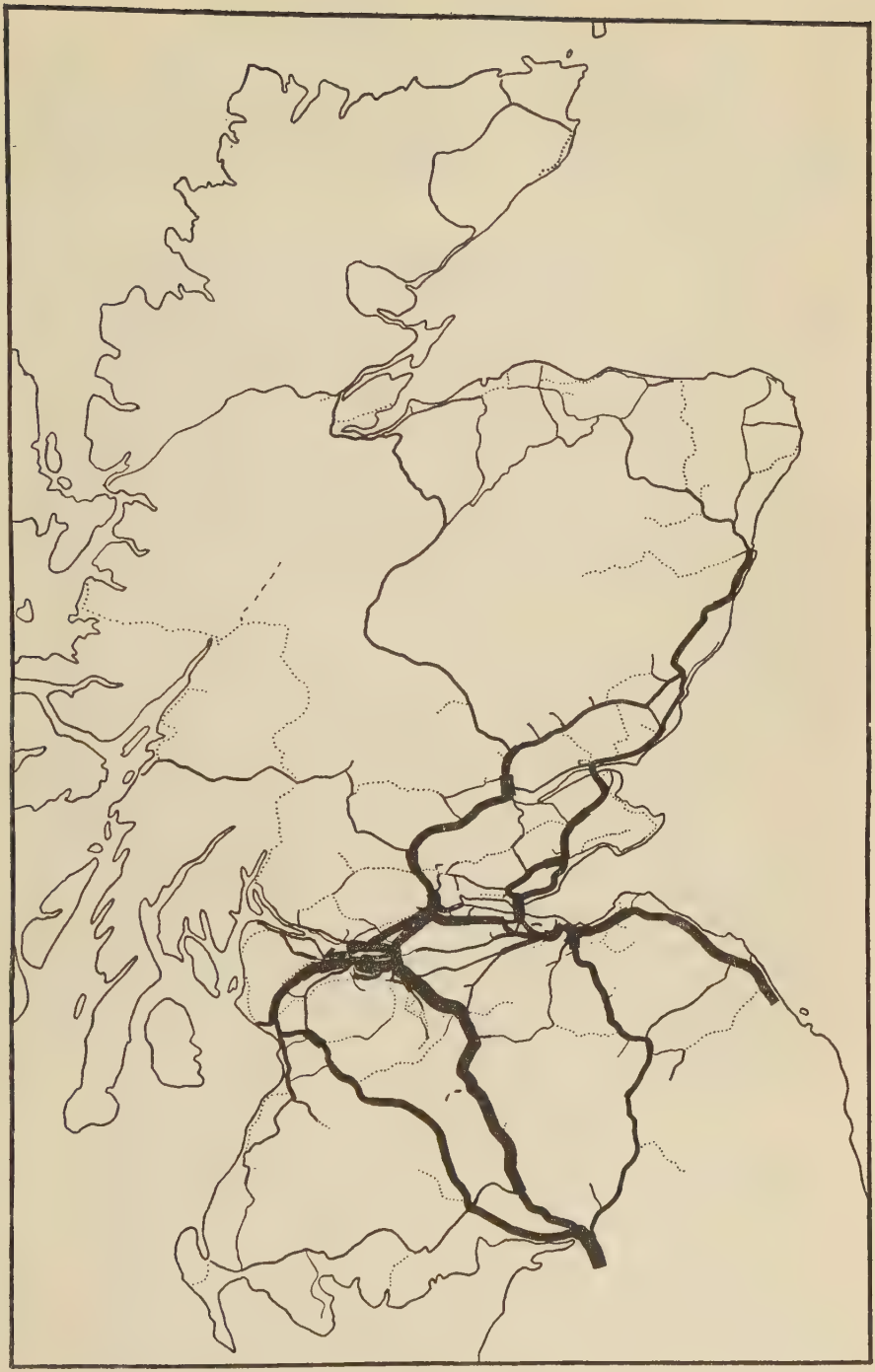


Fig. 5. Goods train services in Scotland, summer 1937. The thickness of the line bears the same relation to the number of trains as in Fig. 4. Dotted lines represent one or two trains per day and a pecked line indicates that there is less than a daily service.

tons in 1888 to 2·8 million tons in 1907, only to suffer a decline to 1·8 million tons in 1936 owing to the trade depression. In the course of improving harbours extensive land reclamation works were occasionally carried out, especially round the Forth estuary. The Caledonian Railway, in the improvement of Grangemouth in 1900-3, reclaimed 260 acres.

Ackworth drew attention to the railways developing transhumance of sheep, the animals being moved in autumn from the Western Isles and Perthshire to winter quarters in Buchan or Angus, to return to the mountains in the spring.[15] This transhumance is additional to the October movement southwards to the Carlisle market for dispersal to English farms.

The railways laid out extensive goods-marshalling yards at strategic points, such as Falahill (south of Edinburgh), Fouldubs, near Grangemouth, Cadder at Lenzie, and at Strathaven Junction, in order to sort out the wagons in an expeditious manner at such nodal points. In addition there were, of course, goods sidings at all the main industrial centres, although in cases such as Greenock where the hills come down to the water the sidings are more remote than is desirable.

While the old rivalries between companies have gone (Fife alone of the Central Lowland counties had only one company serving it), they have been replaced by the more destructive rivalry of the almost uncontrolled road transport services. The railway companies with their lines, docks, harbours, hotels, steamers (on the Clyde, Loch Lomond, to the Western Isles and to Ireland), interest in road services, airways and canals, have, as trustees for their shareholders, a part to play in the continued development of Scottish resources. The geographical controls, as expressed by working expenses in relation to revenue, place an ultimate limit to the facilities that can be granted. The essential framework of the railways has been created, and upon that framework transport services, which are after all the aim of the companies, must be increased or decreased according to changing economic and geographical values.

TABLE A

Railways Built or Authorised before 1830 [2] (and later Built)

Opened	From	To	Length in Miles.	Notes.
1722	Tranent Collieries	Cockenzie Harbour	2	Closed *c.* 1885.
1754	At Bo'ness		⅛	Underground for coals to shaft.
c. 1766	Kinnaird Colliery	Carron Works	2	

Opened	From	To	Length in Miles.	Notes.
1767	Elgin Colliery	Charlestown	6	Horses until 1852; then locomotives and inclined planes.
1768	Alloa	Collyland	2½	
	Pinkey Colliery	Fisherrow Harbour	2	
	At Shotts Iron Works			
	Halbeath Colliery	Inverkeithing	6	Horse-drawn.
c. 1785	Govan Colliery	Tradeston (Glasgow)	1	
1803-22	Caledonian Canal			Temporary railways. Oxen as well as horses.
1810	Carron Works	Bainford Basin	2	Carried iron products to Forth and Clyde Canal. Horse-drawn.
1810	Kilmarnock Collieries	Troon Harbour	10	First Independent Railway Act of Scotland and sixth British Railway Act. Passengers carried although without authority.
c. 1815	Ayr Railway		1	
c. 1818	Newton Colliery	Little France	2	
c. 1820	Ardrossan Plateway		½	
c. 1820	Hurlet Colliery	Paisley Canal	2	
1826	Cairnhill Colliery (Monkland)	Kirkintilloch (Forth and Clyde Canal)	10	Locomotive power. Branches to other collieries.
1828	Ballochney Colliery	Kipps, on above railway	6½	Horses and inclined planes. Passengers. Branches to collieries and ironstone mine.
1831	Edinburgh	Dalkeith		Branches.
1831	Garnkirk	St. Rollox (Glasgow)	8¼	
1831	Dundee	Newtyle	10½	
1831	Ardrossan	Kilwinning	5½	
1833	Wishaw	Coltness	11	

TABLE B

MILEAGE; LONDON TO PERTH AND ABERDEEN

	West Coast. (*a*)	West Coast. (*b*)	East Coast. (*a*)	East Coast. (*b*)	Midland. (*a*)	Midland. (*b*)
To Perth . . .	450	450	462	441½	475½	455
To Aberdeen . . .	540	540	552	523	565½	536½

(*a*) Before and (*b*) after the opening of the Forth Bridge.

TABLE C

Light Railways Constructed in Scotland

Date at which opened for Passengers.	Name.	Length in Miles.	Notes.
1900	Carmyllie Light	5	Opened 1854 as a private railway for Carmyllie Freestone Quarries. Passenger services suspended 1929.
1901	Gifford and Garvald Light.	9½	Closed for passengers 1933. Cattle Special runs Tuesdays for Gorgie Market.
1901	Lauder Light	10½	Closed for passengers 1932.
1901-2	Leadhills	7¾	Reaches 1498 ft. Highest standard gauge railway in Britain. Closed for passengers 1939.
1902	Dornoch Light	7½	Uses Telford's Mound across the Fleet.
1903	Fraserburgh and St. Combs Light.	5	Serves Cairnbulg Cemetery.
1903	Wick and Lybster Light	13½	Takes fish to main line.
1905	Cairn Valley Light	15¾	Carries heavy sheep traffic in season.
1905	Campbeltown and Machrihanish Light.	6	Used old coal line. Closed 1932, now dismantled.
1906	Strathord and Bankfoot	3	Closed 1931.
1906	Maidens and Dunure	19½	Closed between Alloway Junction and Turnberry in 1930. District little developed.

Various other light railways once existed, *e.g.* Broadford to Torrin (Skye) for Torrin marble quarries ; Isle of Raasay for working iron furnace ; Unst, Shetland, for chromite quarries, and the Loch Laggan reservoir construction line. Apart from such light railways the iron road has been confined to the mainland of Scotland.

TABLE D

Opening Bridges over Navigable Waterways

Opened in	Name.	Railway.	Navigation Crossed.
1851	Grahamston	N.B.R.	Forth and Clyde Canal.
1862	Clacknaharry	H.R.	Caledonian Canal.
1885	Alloa	C.R.	River Forth.
1896	Bowling	C.R.	Forth and Clyde Canal.
1900	Grahamston	C.R.	Forth and Clyde Canal.
1901	Banavie	N.B.R.	Caledonian Canal.
1903	Fort Augustus	N.B.R.	Caledonian Canal.

TABLE E

TIME FROM LONDON TO EDINBURGH AND GLASGOW

Year.	Time.	Notes.
1712	13½ days	
1754	10 „	Two days longer in winter.
1776	4 „	
1818	59 hours	Mail coach.
1837	45½ „	„ „
1840	26½ „	Steamer Fleetwood-Ardrossan. Rail rest of route.
	27 „	Rail London-Darlington then coach to Edinburgh.
1848	12 „	West Coast Rail route first completed February 15th.
1856	13 „	Pooling agreement between companies.
1873	10 „	
1888	8 „	Railway race, followed by agreement.
1936	7½ „	
1937	6 „	to Edinburgh.
	6½ „	to Glasgow.

TABLE F

GREAT NORTH OF SCOTLAND RAILWAY OMNIBUS SERVICES IN 1921 [13]

Daily Services.	Route.	Distance in Miles.	Date of Establishment.
3	Ballater to Braemar . . .	16½	May 1904.
2	Huntly to Aberchirder . .	11¾	May 1905.
2	Alford to Strathdon . . .	19½	May 1906.
2	Aberdeen to Cluny . . .	16½	Sept. 1906.
2	Aberdeen to Midmar . .	17	Nov. 1906.
3	Aberdeen to Newburgh . .	15¼	April 1907.
3	Fraserburgh to New Aberdour .	9½	Nov. 1912.

NOTES AND BIBLIOGRAPHY

In the preparation of this study the writer has been aided by the L. & N.E.R. and the L.M. & S.R. placing at his disposal copies of the working time-tables for 1938. Fig. 1 was prepared by gleaning from histories of the various lines the dates of openings of the various sections, mapping these on to a I/M base map, and then analysing by decades as presented in the diagram.

A complete file of the *Railway Magazine*, published since 1897, was placed at my disposal by Capt. S. W. Eames, M.C., and from this much information concerning both the development and the working of the lines past and present has been obtained.

[1] *Old Statistical Account of Scotland*, viii. p. 617, f.n.

[2] Table based on H. G. Lewin, *The British Railway System*, London, 1914, and C. F. D. Marshall, *A History of British Railways down to the Year 1830*, Oxford, 1938.

[3] Robert Stevenson, Editor of Prize Essays on Construction of Railroads, *Trans. Highld. Soc.*, iv. 1824.

[4] C(harles) M(aclaren), *Railways Compared with Canals and Common Roads*, Edinburgh, 1825, pp. 56-7.

[5] Edinburgh and Glasgow Railway. Reports by George Stephenson and Messrs. Grainger and Miller, Edinburgh, 1831.

[6] *Vide L.M. & S.R. Magazine*, May 1924, p. 233.

[7] J. Henderson, *What does the Present Mode of Conveyance to the North cost the Public?*, 1852, p. 10.

[8] From January 1, 1922, the railway companies of Scotland were grouped as follows:

London, Midland & Scottish Railway—
- Caledonian.
- Glasgow & South Western.
- Highland.
- Arbroath & Forfar.
- Brechin & Forfar.
- Callander & Oban.
- Cathcart District.
- Dornoch Light.
- Dundee & Newtyle.
- Killin.
- Lanarkshire & Ayrshire.
- Portpatrick & Wigtownshire Joint Committee.
- Solway Junction.
- Wick & Lybster Light.

London & North Eastern Railway—
- North British.
- Great North of Scotland.
- Edinburgh & Bathgate.
- Forth & Clyde Junction.
- Gifford & Garvald.
- Kilsyth & Bonnybridge.
- Lauder Light.
- Newburgh & North Fife.

At the time of the Act alternative suggestions were put forward including schemes for forming a "Scottish Railway," but these were opposed as leading to a monopoly and also because the most valuable traffic led South over the Border and unified north-south control was desirable.

[9] C. Foxwell, in *Express Trains, English and Foreign*, 1891, noted the following composition of the 7.55 a.m. train *ex* Perth on August 7, 1888. The coaches are in order from the front: Two horse-boxes (L.B. & S.C.R.); carriage-van, horse-box (L.B. & S.C.R.); horse-box (L. & N.W.R.); horse-box (N.E.R.); saloon, horse-box (L. & N.W.R.); saloon, luggage-van, carriage-truck, horse-box (M.R.); horse-box (L. & N.W.R.), luggage-van, three horse-boxes (N.B.R.); sleeping-car (E.C. stock); saloon (G.N.R.); composite (W.C. stock); composite (M.R.); luggage-van (L. & N.W.R.); horse-box (L. & S.W.R.); composite (W.C. stock); horse-box, meat-van (L. & N.W.R.); post-office van, luggage-van, third-class coach, first-class coach, second-class coach, third-class coach, luggage-van, third-class coach, first-class coach, third-class coach, guard's van (H.R.). Probably this was one of the most miscellaneous passenger trains seen on a British railway, and reflects the widespread value of the shooting estates.

[10] C. Dupin, *Narratives of Two Excursions to the Ports of England, Scotland and Ireland*, London, *c.* 1820, p. 47.

[11] *Railway Magazine*, xvi. 1904, p. 440.

[12] E. A. Pratt, *Scottish Canals and Waterways*, London, 1922, pp. 134-6.

[13] *Railway Magazine*, l. 1922, pp. 43-50.

[14] *Ibid.*, liii. 1923, p. 38.

[15] W. M. Ackworth, *Railways of Scotland*, London, 1890.

FOREST OR BOG: MAN THE DECIDING FACTOR

A Study in the Vegetation of the Districts of Lorn, mid-Argyll, Knapdale and Kintyre in Argyllshire

By J. W. Watson

In any region where he has been long at work it might truthfully be said that the vegetation is the mirror of Man, since in its nature and distribution it so frequently reflects his activities. An attempt is here made to measure the extent to which this is true in the South-West Highlands of Scotland, where the modifications of Man, great as they are, have not yet masked the originals of Nature.

The main lines in the composition of the scene it must be admitted are the work of Nature ; and they are everywhere and always evident. Yet Nature herself does not appear to have decided in which style to finish her picture ; for there is an uncertainty in her work which renders prediction hazardous.

The effect of latitude is one of the more permanent factors. Lying about 56° N., the land has long winters—with the sun low in the sky and weak, and shadows persistent and strong—and short summers with long duration of light, to which growth is largely restricted. In midwinter the sun's altitude at noon is only 10°, and some deep, transverse valleys are in complete gloom ; whereas in midsummer the sun is at that height by five in the morning, and climbs to at least 56° before it begins to decline. During these long hours of light, growth becomes very rapid and is in fact out of all proportion to the intensity of light received. Those plants, therefore, grow best which grow most quickly, and the spruce succeeds where the beech fails.

Again, situated in a latitude intermediary between the cold airs of the North and warm ones from the South, the region experiences a great number of atmospheric disturbances, often bringing with them high winds, cloud and rain, while at the same time the interpenetrating seas tend to modify temperatures and to increase humidity ; so that a cool, moist climate prevails, which is conducive to coniferous forest and wet moor. Further, the region is seen to be situated on the remote north-western border of Europe, away from the lines of colonisation which have brought to more central areas a richer variety of life ; while it suffered not long since from an intense glaciation which has profoundly disturbed and influenced its system of drainage, soil growth, and manner of life. Both in space and in time, therefore, conditions in the region are transitional rather than well established ; and many of its features, as drainage, soil, tree growth and land fauna, thus appear to be at an arrested or immature stage of development. Botanically, it reflects these major controls and limitations in that it is a " zone of tension " between the further North and West—lands of the blanket bog and moor, with soils chronically too wet and acid for trees to flourish—and the drier and warmer South and East where soils maintain their fertility and forest tends to dominate.

Dr. Godwin, from his study of pollens embedded in the peat of various parts of Great Britain, argues that the climatic conditions which prevailed after the Ice Age favoured initially the growth of forests ; but an increase in rainfall to the high level at which it has been maintained, and the bad drainage of the West, have tended to a leaching and waterlogging of the soil which renders it too sour for trees to flourish and assists the spread of *Calluna* heath and bog. For it is true here, as in other " zones of tension " in Britain, that " the usual type of transition in the natural vegetation as the altitude increases [in this case from damp oak wood through pine

forest and birch to heath and moor] can clearly be related to the greater rate of leaching in the higher zones." To-day the vegetation reveals the indeterminable struggle in a still vigorous but limited tree growth, and in a heath which once expanded at the expense of the forest but is now succumbing slowly to the domination of wet moor and bog.

Forests are found chiefly on the lowland and lower hill slopes. On the lowland, where an open soil is common, they consist chiefly of damp oak, hazel and rowan ; but on the hillsides, where leaching is more pronounced and a closer, more acid soil occurs, they merge into pine and birch. Much of the free growth is being replaced by plantations of exotics like the spruce and larch. Whereas in the West conifers are planted everywhere, regardless of distinctions in the type of soil, in regions of mature soil development such is the difference between the closer and more open types that it is doubtful if the latter should ever be planted with conifers to the discouragement of deciduous growth. Considerations of accessibility and shelter from the wind are at present, however, given more importance than that of soil type.

Heath is abundant on the mountain land and on patches of acid soil—related sometimes to the underlying rock and sometimes to the conditions of drainage—and is found as *Erica* along with *Nardus* on the drier sites and as *Calluna* with rushes on the wetter. In Lorn, between the acidic granites that form its outer rim and the Ben Cruachan basic mass, there is a marked contrast reflected in the rugged, heather-covered sides of the one and the smooth, grassy slopes of the other ; while *cruachs* of acidic lava stand up above the more basic or ill-drained parts of the Lorn lavas in a similar contradistinction. Elsewhere rule the wet moors and bogs (except where Man has held them back) of damp-loving grasses, rush, myrtle and moss on the lowland, and of moss, myrtle and cotton-grass on the hilly uplands, with *Scirpus* and moss on the highlands.

Within these general limits the actual distributions of vegetation are determined by forces more peculiar to the district. For instance, while the short growing season, high rainfall and poor soil may have limited the general range of tree growth, it is the local exposure to wind and rain, the facilities in drainage, the changes in soil, and above all the work of Man, that determine the actual distributions.

The region as a whole may be thought of as the broken edge of the Central Highlands, which have been fractured by volcanic activity and by rifting (with the formation of the Atlantic basin), and interrupted by great masses of igneous rock, mostly in the form of sheets or domes. On this shattered zone the ice worked out deep basins and troughs, to produce a surface still more irregular ; while into these troughs the storming seas ran up with the retreat of the ice and carried their erosion into the very heart of the land. Finally changes in sea-level led to a step-like coast, of old sea-cliff and

beach, being stranded above the present shore. Thus a very varied and immature topography is in process of evolution. A low coastal plain borders the sea and fjords, stretches back into the mountains along deep, glaciated valleys, and passes through a hilly upland, partially levelled, into the mountainous remnants of the Highland Plateau. These topographic divisions are reflected by the vegetation, so that altitude and character of relief as much as latitude and climate determine the threefold association of: (1) forest, once dominant and still most common on the lowland; (2) wet moor and bog, to-day prevalent on the hilly country and extending up to the mountains; and (3) heaths and alpine moors on the heights.

Relief is probably fundamental, through the medium of rainfall, which promotes a further division. Thus with an increase of rainfall from the coast towards the higher interior, and the concomitant accentuation of poor drainage and soil conditions, there is a marked zoning of damp-loving plants, from *Calluna-Molinia* along the low coastal hills with about 55 inches of rain, through the myrtle-mosses of the uplands with 80 inches, to the peaty heaths of the heights with over 100 inches and acid soils. In particular a fairly constant change seems to occur from *Agrostis* pastures on slopes with less than 60 inches to *Molinia* pastures where rainfall exceeds 70 inches; *Agrostis*, for instance, flourishing from Kilmelfort to Lochgair, and *Molinia* from Loch Scamadale to Furnace; the one common to Oban and the west side of Kintyre, the other to Dalmally and eastern Kintyre.

The fact that there is little difference in the major classes of soil in the region makes the *rôle* of rainfall even more important, since it is responsible for some of the chief variations. Most of the land is under a brown forest soil; but changes in texture and profile everywhere occur. On the lowland the soil is fertile, since precipitation is moderate, and drainage, either by Man or Nature, relatively good. There is therefore neither much leaching nor waterlogging, especially as in late spring and summer evaporation may be greater than rainfall, with the result that the soil may become aerated and bacterial life have every chance to develop. Relatively rich thus in minerals and bacteria, drained and aerated and worked upon by Man, the lowlands favour forest, grasses—and bracken! In the hills, however, to which neither rejuvenation of the drainage system nor extensive ditching has reached, and where humidity is greater, rainfall is always in excess of evaporation and the soil may never be aerated. The minerals are washed out, bacterial activity is restrained, and acidity encouraged. In these conditions mosses and bogs form and entrench themselves. This is well illustrated on the hills above Inveraray and Glenorchy, where, with scarcely a period in the year when the soil can dry itself, leaching and acidity are spreading and peat is steadily forming; and since "the rate of change of soils increases very rapidly with increased rainfall," one can but predict an intensification of this peat.

There is thus a correlation between rainfall and the rate at which the vegetation deteriorates, although other factors are also present ; and we may suggest the following sequence : (1) from forest to *Calluna*, chiefly on the lowland and lower slopes ; (2) from *Calluna* and grass moor to myrtle moss or cotton-grass moss ; (3) from *Calluna* and moss to peat on the upland and high residuals. So whereas in the lowlands trees may still seed and grow, on the hills they do so with much greater difficulty, and on the acidic highlands they fail altogether and give way to peaty heath. The tree limit at 900 feet, which many attribute to the high velocity of the upland winds, may therefore have an explanation in the increased rate at which deterioration takes place, a factor to be related to drainage as well as to rainfall.

One of the chief handicaps to a healthy vegetation in the South-West Highlands is the lack of good drainage. With a broken topography in which there are many flat surfaces, a high rainfall and an immature stream system, much of the region is in danger of being waterlogged. By subtracting the amount of evaporation from precipitation at different altitudes, and estimating the run-off on different soil-types at various degrees of slope, one could find out and map the amount of waterlogging in the area. Assuming that waterlogging will result where all the water is retained, there is a liability to saturation of up to 66 per cent. at an altitude of 100 feet, and of just over 100 per cent. at 1600 feet. That is to say, the peat-forming process rests for about one-third of the year on the lowland but may be continuous on the highland.

Parts of the highland massif are drained only by a slow seepage, so that where the soil is open and thin a dry heath may spring up ; but where the soil is more retentive and waterlogged, peat steadily forms. The lower hill country is better served by streams, but is still badly drained, and among the lavas there are many flats with enclosed drainage systems. At about 1250 feet one constantly finds broad levels, suggestive of some past planation, rimmed by stream-flashing edges covered in a *Calluna-Molinia* association, but sinking towards reed-choked lochans, where myrtle, moss, rush and peat abound.

The ice-cut valleys are scarcely better, since the streams which to-day drain them are too small properly to flush them, or they are filled with morainic detritus ; and their bottoms and flanks are often very boggy, with myrtle, moss and rush, relieved only by a few cultivated tracts on flood-plain and terrace. The coastal lowland is perhaps the most varied unit in the landscape and bears a very mixed vegetation accordingly. Parts of the old sea-beaches away from the reach of rejuvenation form ill-drained levels of sedge, rush, wet grass and scrub ; while the better-drained slopes near the quickening stream or ditch carry cultivated fields and plantations. The cliffs and ravines offer refuge to roughage such as birch and bracken, and to a *Nardus-Erica* heath. Thus everywhere the effects

of good or bad drainage are seen ; and it is realised that one of the prime needs of the West is an artificial system that will make good the defects of Nature.

Even more particular distributions result from the differing conditions of insolation, exposure and growth of soil dependent on slope. Gentle slopes aggravate the formation of peat, and one constantly finds the bog creeping outward from them over high and low land, especially on parts of the old highland massif with much rainfall, and on the badly-flushed lava tablelands and old sea-beaches. Steep slopes, on the other hand, alleviate the general deterioration, except where they offer refuge to bracken, and tend to support a dry grass pasture or heath. Thus in regions of abundant rainfall *Agrostis* may dominate instead of *Molinia* where the slope is relatively steep and drainage good. Wind-swept slopes are noted for their absence of trees, and shaded ones for the prevalence of bracken and scrub—especially as Man avoids them in husbandry. So the forest—which, we are told, once covered most of the land—has retreated not only from the bog on the flats, but also before the moors and heaths developing on wind-swept and steep gradients, and now maintains itself successfully only on the more sheltered, gentle or shadier slopes.

Even before the advent of Man, therefore, the distribution of the types of vegetation must have varied, and one must not claim too much in his name. Nevertheless his coming made even greater differences, for he has introduced new species and liberated or repressed others until both the composition and the distribution of associations have been changed, and the landscape made anew. In earlier days, the action of Man as a hunter consisted mostly in reducing the animal population ; but since men were few and hunted only in small groups, we cannot conceive any marked alterations. Possibly trees were thinned by fire and axe, or roughage increased with the depletion of game, but at most only a very small strip along the coast was affected. The fact that the peat-forming process is slower on the coast than on the upland, and that there are yet considerable tracts of peat there, suggests that these areas were cleared long before the hills ; which is just the opposite of what happened in the Pennines, where Man cleared the uplands first, and so accelerated the formation of the notable Pennine peats. In both cases, however, his attack was made on the most open kind of woodland first. Indeed in the West the old sea-beaches probably bore more of a scrub than a forest, and were relatively easily cleared. From the beginning Man seems to have liberated the bog, for where he first worked peats have most formed.

More serious was his mark when Man tamed instead of killed animals, for the continual attack on trees by goats and on roughage by cattle may well have kept down secondary tree growth in some of the cleared regions and so assisted the spread of grasses and of *Calluna*. In time, and as population developed, both a more ex-

tensive and a more intensive attack was made, with new settlements growing up in inland loch basins and with a better husbandry : which meant wider clearances of forest. Grasses advanced in areas of more intensive use ; while *Calluna* established itself elsewhere, or perhaps passed into moss on flat, undrained and ill-used surfaces.

Even so, exploitation was far from thorough, for men still followed the hunt—that barrier to so much progress !—and widespread clearance was stayed. For with a high mortality from disease and from warfare, population remained too low to exert that pressure on the land which makes men look for new processes or new resources. Exploitation was concentrated chiefly on the lowland, by sea coast or loch basin, where indeed forest very largely disappeared before pasture, or came up in its secondary growth only as light scrub.

By the middle of the eighteenth century, however, the terms of life had been changed. Population was steadily increasing. The pacification of the Highlands meant the diversion of energy to directions other than war, the imposition of game restrictions, the substitution of a new money economy and the introduction of the tenant and labour systems. Men had now to work the land for their living, and the harder they worked the better they lived. More land thus tended to come under cultivation, and more cattle were kept, with a consequent clearance of forest and the repression in cleared areas of rough growth like brush, bracken, myrtle and rush. Dr. Johnson in his tour of the Hebrides notes the extreme bareness of the landscape in the Isles and some parts of the mainland —where pressure on the land was considerable—and tells us that he had to strap his walking stick to his saddle, " lest the natives should run off with so great a piece of timber " ; while I have read that in the early nineteenth century the crofters at Dalmally actually quarrelled over the sharing of the brackens, so little was there of them. How different from to-day, when they cannot be got rid of !

Many small industries also were set up : as the making of lime and kelp, the building of boats for the developing fisheries, and the mining and smelting of local or imported iron ore, which consumed an enormous amount of wood. In Campbeltown alone no less than twenty-three distilleries were founded in the eighteenth and nineteenth centuries. The increase of population, however, quickened by this activity, went beyond the support the land could afford under the prevailing conditions of exploitation, and dreadful poverty occurred—relieved for the most part only by the landlord. Reviewing the opportunities offered by new industries and by fisheries, Dr. Smith in the *Statistical Account* writes : " One would naturally suppose the people of Campbeltown to be rich ; but, instead of that, there is not perhaps in Scotland such an aggregate of miserable objects in so small a space."

Baron Baillie, writing to the Forfeited Estates Committee, said : " I earnestly wish the commissioners may soon settle some proper

method for employing the numerous peoples . . . so as they may be able to aliment themselves and their children as the only way to make them happy ; for their own grounds are not sufficient for the support of one half of them." We are also told that " farms which one family are able to labour have from four to sixteen families living on them," and that " there is occupation for no more than half." Small-holdings continually broke up, until many families had to re-establish themselves on poorer hill land where they lived on the verge of famine. Graham writes that " constantly the crops failed on the crofts : every third or fourth year there was a dearth and people were dependent on the landlords." In 1801 there were 26,000 more people in the main Highland counties than in 1901, a century later. Had a planned economy emerged no doubt these people might have remained (and the land been well cultivated to give a strong hold to the grasses) ; but the burden of relief and the greater profits to be derived from sheep tempted the landlords simply to evict many tenants and to take up sheep farming.

Nor can we blame them in a way, for pastoral farming, better suited to this environment, became immediately more profitable than the old crofting or mixed system. Sinclair estimated that a landlord could gain from three to ten times more out of his land by turning it over to cattle or sheep. It seemed to some that men were needed for Imperial conquest and colonisation in the new lands, who on their own lands, as the Bishop of Limerick remarked, were only " a nuisance and a pest." Indeed this increase of population at a desperately low standard of living became a serious problem. Sir J. McNeill in 1851 writes that " Men of all classes concur unanimously in declaring it to be impossible to provide by any means for the permanent subsistence of the whole of the present inhabitants." Failing to see that the trouble was not the land but the stage of economic development, the authorities encouraged emigration ; and cultivation and the number of cattle decreased accordingly.

In the absence of plough and drain and of that peculiarly effective manuring, treading and grazing by cattle, rushes and roughage spread over the fields and *Calluna* heath and moss resumed their sway. Thus the deteriorative activities of Nature came to be paralleled and accelerated where Man had previously worked. Wealth was still largely dependent on the land, however, and in time a better husbandry evolved on the big holdings which kept much of the lower land fairly clean and began the planting of trees, while crofters made their position more secure, and many estates still kept up a full complement. Thus a more or less even balance was maintained between the good and the bad trends.

To-day the future seems once more to be full of change. For again the terms of life are altering, and interest is newly concentrated on the land, perhaps to shape anew the living landscape, since an exact study is being made (by men like Sir R. G. Stapledon)

of how to check deterioration and to improve the hill lands of Britain.

Some trends of change might be indicated. The policy of the nation in building for itself a reserve of trees, both against the threat of war and the wastage of natural resources, cannot but be welcomed ; and the West Highlands have much beside their natural suitability to recommend them for re-afforestation. In the first place there is the need for new sources of wealth. That the present economy is inadequate to encourage an increase in, or even to maintain the present population, is indicated by the continual emigration ; numbers actually being kept up by an inflow of Lowland folk who are attracted by the low rentals. But those coming in and those staying on are very often older people : for youth seeks a better chance.

There are some who think that afforestation may be that better chance ; and not a few intelligent farmers expressed the opinion to me that from the economic and social point of view their land would be better under forest than sheep. Dependent mostly on their own family for labour, these men could not afford properly to maintain the land, and were aware that in time the continuation of present conditions might undermine prosperity altogether. Now in parts of Scotland it may be true that forestry is taking over land which could better be used by farming, and there are certain regions in the West where one hopes the farmer will continue to till the land and produce food ; but there are also certain areas where the present farming makes no better use of the land than might forestry. Meanwhile these estates are rapidly deteriorating with the spread of bracken and of rushes ; whereas to afforest them would mean to clean up the land and to keep it in good condition. It might also mean the employment of more men, since forestry has already shown itself, as at Inverliever and Barcaldine (eleven miles north-east of Oban), able to give more permanent employment in developing these areas than farming once gave. At Inverliever I was assured the increase was about 40 per cent., and yet there was room for more men ; and where a dual economy of afforestation along with small-holding evolves, as to some extent it has done at Barcaldine, a still better use might be made of the land. At the same time the sheep farmer need not be wholly replaced, as he can use the country over 1000 feet—a country, moreover, which is drained for him by the forester.

It is true that the outlay of many years and much money makes grown wood dear, so that it has difficulty in competing in the present market with the cheaper free wood ; and since men do not willingly labour without reward, afforestation, especially private, is restricted. Nevertheless, dear though it may be, grown wood is stronger. For whereas under natural circumstances trees grow irregularly—at first rapidly, and then in their struggle to overcome each other more slowly, and finally as dominants more rapidly

again—to form an uneven sort of wood, planted trees are periodically thinned and treated, after which they grow up evenly to give a stronger wood that stands up better to strain. The more widely this is recognised and the more difficult it becomes to acquire free wood, the happier will be the future of our forests.

In the second place forests are beneficial to the land. The soil, for instance, is opened to aeration and to new activity by the prerequisite and extensive drainage involved ; and is further enriched by fertilisation and the formation of forest mould, so that it promotes a better growth. Better soils and stronger growth are thus a feature of planned afforestation. Further, if catchment basins were planted where possible, stream regimes might become more regular, and the floods which every year cause a certain amount of anxiety, if not of impoverishment, might be mitigated. In these ways forestry may come to help farming instead of to rival it.

Finally a general increase in afforestation would mean not only a new source of wealth but also new sources of work, demanding as it would the better transport facilities which the present farming looks for but scarcely warrants, and encouraging local industries. If this should be the case, it is sincerely to be hoped that local labour will be used, for the employment as at present of Lowland or of English people in forest schemes while native folk need work seems unjustifiable. Let those to whom the land is more than a source of work perpetuate its significance in a new lease of life.

It has been seen how the high rainfall and bad drainage tended to leach fertility from the soil to the detriment of tree growth, and how Man himself accelerated this tendency and at one time was in danger of completely exhausting the forests. For by clearance and then by a careless use of the land, without planning and with little thought for the good of the land itself, Man permitted deterioration to intensify until the natural propagation of trees was restricted to a few lowland areas. If the present re-afforestation becomes more widespread, Man may rectify his mistakes and so change the course of things as to bring back the forest into its own. Already his transformations are everywhere evident. He has replaced the poorer free growth with plantations ; has introduced new species to the region, enriching the forest ; has improved many thousands of acres of land ; planted new areas which include both inland glens and hillsides ; and won back from the poverty of the bog new wealth for the nation.

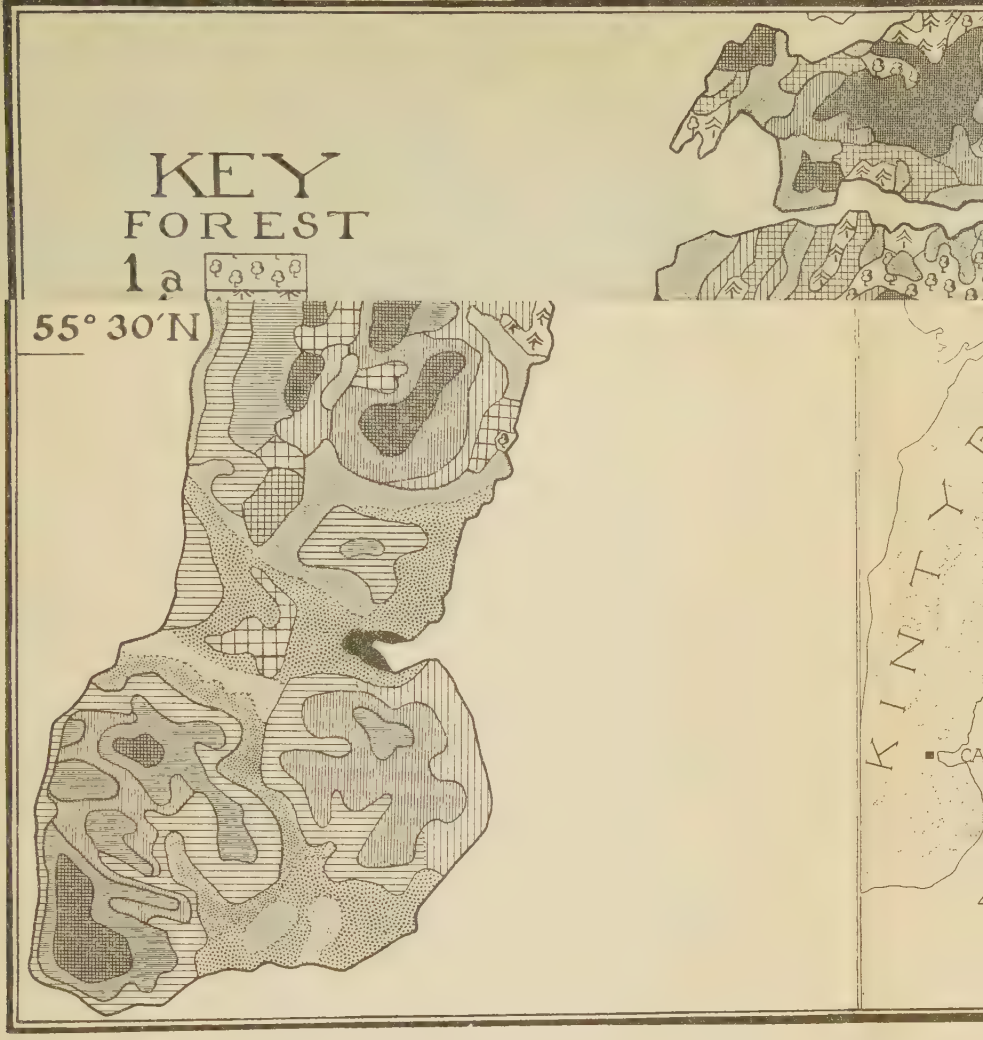
Another interesting experiment helping to transform the land is the introduction of small-holding. As yet the scheme has not drawn a full support ; and in some parts the small-holder has misused his opportunity, attempting to enter into the general economy of the region on too small a basis. But where he has adapted himself to his limitations, or can depend on supplementary aid such as pensions or the holiday trade, he makes a good use of his land. It is argued that a large farm can use an estate better, and with only

a few less men ; but much may be said for its partition into small-holdings, on the grounds that it is better to be a tenant than a labourer, that more people do earn a living, and that cultivation, improvement and the keeping of cattle are necessarily developed. The large farm, however, tends to be dependent more on sheep than on cattle, or cannot afford a full complement of labour under the present conditions to till the land. A new small-farm economy making cattle its basis means the restriction of roughage such as bracken, and the increase of good grassland ; and would further stay the advance of bog. Such an economy has not as yet risen from the small-holding scheme ; but if it should do so it would greatly benefit both land and people.

Over against these trends for a healthier state of affairs, helping the spread of good grassland and forest, there must be set several that are detrimental, and that are assisting the bog. Thus prevailing circumstances in farming make it difficult to keep the land clean and healthy. The sheep which form far the greater part of the stock cannot suppress the coarser grasses, rushes and brackens, and, with the spread of roughage, tend to concentrate on the greener grazings, which they overgraze. Pastures are thus steadily deteriorating over many parts of the region.

Much more care needs to be taken over the grasslands of the West. Left to sheep, which do not tread or manure them enough to compensate for the continual and selective grazing, they can but decrease in value, as Sir R. W. Greig has pointed out. For example, on one farm I visited, of 400 acres, there were pastured 100 cross-bred sheep, so that it was, for the region, actually understocked. Yet in 1935 twenty sheep died. At that time I was interested in the causes of sheep mortality and I investigated this rather peculiar case. I found there was nothing more wrong than sheer under-nourishment ! Much of the farm ran back on to a steep heathery *cruach*, well drained to very dryness ; and only about a quarter of it was under green grazings. For the rest, whins, bracken, *Nardus* and heather were dominant. It seemed as if these had been spreading for some time, since there were patches of permanent grass amongst them. Apparently unchecked, they had narrowed down the area of subsistence for the sheep, which concentrated so wholly upon the greener pasture that they had come to impoverish it and could no longer be satisfied from it. So twenty of them had stayed their hunger by eating dirt, wool and roughage, and had pined to death.

The rules of husbandry also are with difficulty observed. For instance, unless heather is burned every few years it grows patchy and is of little service. The stronger plants, if not held back, kill out the weaker, whose place is quickly taken by rushes in wet soil, *Nardus* in thin and dry soil, or bracken in the best situations of all ; until the heather as a whole gives way to bracken or the moss. Sporting interests, apparently blind to this process, considerably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limit the burning of heather, so that both farmer and land (and in the long run the sportsman himself) must suffer. Moreover, burning by small strips, as is done to-day, may assist the sheep in their destruction of the heather, so that the farmer finds it hard to preserve a good heathland. There is also less draining being done, since the cost of labour has increased and profits generally have decreased. Unless farming is offered a surer return it cannot look after the land as it ought (and being unable to look after the land it cannot produce as much as it might) ; and meantime along the choked drains the green *Agrostis* or meadow grass is turning to *Molinia*, fescue, rush and moss, and the bog continues its advance.

Cultivation, for similar reasons, is on the decrease. Thus over mid-Argyll, the cheese makers, excluded from the milk schemes, have ceased to cultivate hundreds of acres, and are now following an economy of raising store cattle and sheep which does not necessitate the costly improvement or maintenance of their land ; and fields of good grasses are passing slowly into bent, or bracken, or rush. So as husbandry recedes deterioration spreads, and the landscape is given an ever more ominous tone : the brown of the rush tops for the white of the clover ; until one feels that unless something can be done for or by the farmers, ruin may well entrench itself in the form of the ever-encroaching bog.

There are those who hold that the region is not worth developing more intensively, but that it should serve other than agricultural or local purposes, acting perhaps as the playground of the nation, a resort for tourist and sportsman. Leave to the farmer the Lowlands, but to the sportsman the Highlands ! Of these people we ought surely to ask: what of the land and the folk ? The West Highlands and Islands have long been an entity in themselves ; they have a tradition worth perpetuating ; and how, if their lands be sacrificed to imperious pleasure-seekers, shall the continuity of their story be maintained ?

For instance, to both folk and land, the present extension of deer forest cannot but be harmful ; for at the least it means the replacement of a productive by a non-productive economy. Even though it be true that the replacement of a sheep farm by a deer forest may not cause less employment, it can hardly be denied that it will impoverish the land. But where several sheep farms have been turned into a forest, there is undoubtedly less employment, and even further impoverishment. For no improvement of the land is necessary, since no market need be considered. Possibly a time will come when deer forests will need attention, for deleterious effects must be suffered by the deer stock. Deer eat more voraciously and delicately than sheep and so let the roughage spread even more widely and rapidly over the hills. Up to the bracken limit on one deer forest I visited, the hills were from 60 to 80 per cent. covered with bracken and birch, although only two decades ago they were accounted good rough pasture. This will surely force the deer in

time to overgraze the greener parts, and yet further to impoverish the land, to their own detriment. Where farms have been dispossessed of cattle and sheep, then, and joined into deer forest, nothing but deterioration can be expected ; and when brackens begin to march, stone walls do not stop them. Because of this, and because forests are often unfenced and deer wander on to neighbouring pastures, deer forests are a source of not inconsiderable damage to farm holdings. Now when high rentals were received, no doubt the impoverishment of the land was overlooked ; but rents are falling, and the land is becoming still poorer. So where is the gain ? Unless deer forests include a certain number of cattle and sheep (as some of them do), and are kept in better condition, they are a real loss to the land and the community.

Short-sighted policies thus tend to cancel those far-sighted ones that look as much to the improvement of the land and the benefit of the people as to profits ; and the struggle between the bog and the forest or the better grasses is far from being decided.

Looking back, then, across the developing scene through the ages, we must say that Man has on the whole reduced the forest, though he is now replacing and enriching it, and bettering its habitat ; and has liberated the bog and wet moor, which with their mosses and rushes are encroaching on those grasslands and heaths which he once encouraged but now has difficulty in maintaining. And when we say this, we burden him with the chief responsibility for the fate of the living landscape ; since his work has been the most influential in the region in determining the particular condition and distribution of vegetation, and since he can freely choose what to support and what to suppress.

Thus the primeval landscape has through time been almost obliterated. Still we can glimpse its general outlines : the forests of oak that carpeted the lowlands, broken here and there by heathy crags and cliffs, or by gleaming marshes ; the forests of pine and birch that swathed the hillsides, broken too by stretches of heath on leached moraines or steep *cruachs*, or by bogs spreading out from the lochans in the hill flats ; and moor and heath contending on the mountain, with clumps of birch lining the streams. To-day, however, a new landscape appears, as revealed by the map ; in part due to the natural tendencies against tree growth and in favour of peat, but even more to the activities of Man, to whom it stands as a true and terrible mirror.

And now : what of the future ?

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A NEW INDEX FOR THE ANALYSIS OF REGIONAL TRENDS

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It is now widely agreed on both sides of the Atlantic that geographers are concerned not only with regional facts as they exist at a given time but also with landscape changes, or the reconstruction of successive past geographic landscapes.[1] It is proposed in this paper to introduce the term "dynamic geography" to denote the study of *trend* as a characteristic element of landscape : of changes that are in process of occurring at a given time. "Dynamic" is used in the sense of "pertaining to forces not in a state of equilibrium." The noting of current landscape trends may not only throw much light upon regional relationships, but may also save a culturo-regional report from early obsolescence.

It is common for regional reports to mention current landscape trends in a general way, and even to project such trends into the future. In such analyses of regional change, chief reliance is usually placed upon statistics covering previous years. For population, production and foreign trade such statistics are available for most parts of the earth. These figures for the past, however, sometimes fail to describe the current situation, and for some important landscape elements such as crop acreage or housing they are entirely lacking in many parts of the world. It is the purpose of this paper to suggest a statistical method by which

regional trends may be detected and quantitatively expressed through a single field exploration, even when the region under consideration lacks census coverage. Where some census figures are available, the method makes it possible to determine whether the census trends have continued in operation. It is probable that shifts in the form of land utilisation have always characterised the developing cultural landscapes of the world, especially upon the frontiers of settlement, and in the present era of rapidly planned and even unplanned readjustments the subject seems to have particularly timely geographic import.

A Dynamic Index

By determining the number of young or new members of a given element in the landscape, we can decide whether the element is increasing, decreasing, or stable in extent and intensity. This essentially field method is the one used by the plant ecologist when, by noting the relative abundance of young trees at the edge of a forest, he discovers whether the forest is expanding or contracting. Similarly, the proportion of young children in the population is used to obtain an indication of current population trends. In the present paper, this method of trend analysis is extended to other elements of the cultural landscape, and particularly to the elements of agricultural land utilisation.

The more permanent forms of agricultural occupance, such as orchards and vineyards, lend themselves well to this type of analysis. Statistics of orchard trees obviously have more landscape significance and are less subject to violent seasonal fluctuations than the figures of fruit production. From statistics of bearing and non-bearing trees, obtained from the census or from field samplings, the proportion of young (non-bearing) trees in the total tree population can readily be calculated. This proportion (non-bearing trees divided by total number of trees) may be called the "dynamic index," since it provides an index to the activity of planting.

Some use has recently been made of such an index by agriculturists to forecast changes in fruit production,[2] and in one case detailed estimates of annual production for five years in advance were made on the basis of tree age.[3] Dot maps showing separately the number of bearing trees and the number of non-bearing trees have also been published,[4] but such maps, valuable as they are for localising our knowledge of the fruit areas, have little diagnostic value for trend studies. W. D. Jones, who has called attention to the desirability of mapping ratios to obtain an insight into agricultural geography,[5] considered only the static and not the dynamic type of ratio. Systematic regional mapping and analysis of the Dynamic Index as an indicator of orchard trends have apparently not hitherto been attempted.

Figs. 1 and 2 illustrate a graphic use of the Dynamic Index. The areas of the circles are proportional to the total number of trees of the species indicated in each state or county, and the wedges represent the proportion of non-bearing trees. The circles are centred in the producing districts. Thus the relative importance and the trends in each county may be noted at a glance. Fig. 1 indicates that in 1935 Florida and the lower Rio Grande area of Texas were close rivals for first place in total number of grapefruit trees, but that Texas, with a Dynamic Index of 35, was experiencing a tremendous expansion compared with Florida, whose Dynamic Index was only 9. Great activity in the smaller, south-western districts is also indicated. As the young trees come

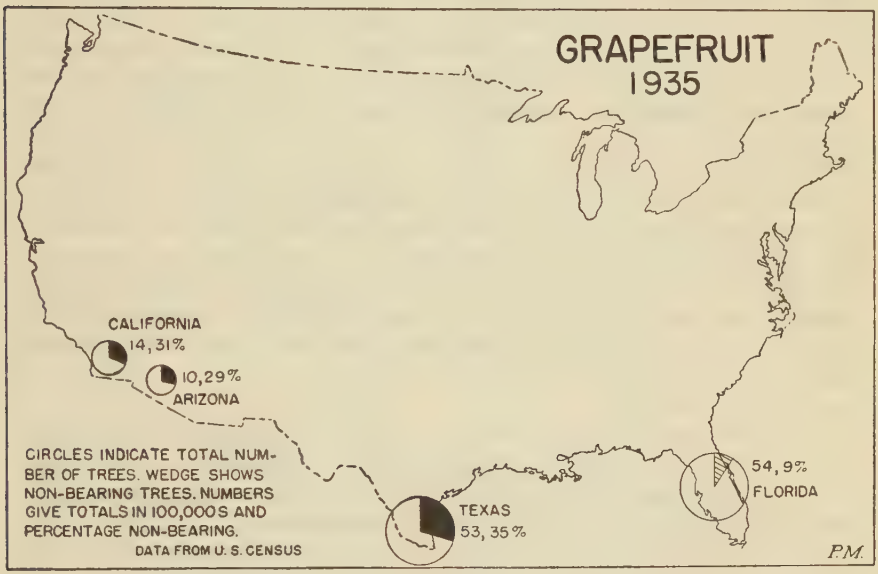

Fig. 1. Dynamic Index map for grapefruit in the United States, 1935. National total, 13,161,000 grapefruit trees; Dynamic Index, 23.4.

into bearing, bearing acreage may be expected to increase, though new plantings have been much reduced since the catastrophic drop in prices after 1935. Fig. 2 shows that in Florida an internal shifting in regional emphasis of orange plantings is apparently in progress, while the state as a whole has a slight upward trend in number of trees.

The Neutral Point

Between a large Dynamic Index indicating expansion and a small index indicating contraction, there is theoretically some intermediate point where new plantings are barely sufficient to maintain the existing total acreage. This "neutral point" is of value in

distinguishing between areas of expansion, areas of contraction, and areas in equilibrium. At best, the neutral point can be determined only approximately. One line of approach to its determination may be called the biological method. If we find, for example, that orange trees require five years to come into bearing, and have an average life of fifty years, then a ratio of 5 to 50, or 10 per cent., would represent the proportion of young trees necessary to perpetuate an orchard. So many variables, natural and cultural, are involved, that it is impossible to make an exact estimate of tree life, but the biological method can at least furnish a rough estimate of the neutral point. An interesting trial in this direction was made recently in the State of Washington, where it was calculated that on the basis of fifteen years' length of life, about 14 colts less than two years old per 100 animals two years old and older are required in order to maintain the horse and mule population at a stationary figure, and a decrease in the equine population was forecast for those districts having a lower proportion of colts.[6]

A second line of approach to the neutral point is the method of statistical experience, by which analysis is made of changes of acreage that have actually followed specific Dynamic Indices. The chief limitation upon this method is the lack of an adequate series of data for some cases. For a few regions detailed annual statistics are available ; for other regions reliance must be placed on census statistics at five- or ten-year intervals ; and for still other regions and for minor varieties of trees in most regions, data are completely lacking.

For the accompanying maps of citrus orchards the neutral points were statistically estimated, and a difference in shading was used to distinguish between areas with positive and those with negative indices (indices above and below the neutral point). For such widely-distributed varieties of fruit as apples and peaches, the neutral point shows pronounced regional differences. In peaches, for example, the neutral point for the great Georgia and California districts is about 20 to 25 per cent. In New England, due to excessive winter killing, and in the deep South, due to diseases, parasites, and indifference, the neutral point for peaches is about 40 per cent. Even within a small area, local climatic, edaphic, and cultural factors may result in large differences in longevity and hence in the neutral point. Thus, in the peach district of south-western Arkansas trees on good red clay subsoil are said to live twice as long as those on loose, deep, gravelly soil ; in southern Texas citrus trees with favourable soil and drainage live about twice as long as those with unfavourable conditions ; and in Washington State, apple trees live twice as long in the humid west as in the arid interior.[7] Thorough interpretation of the mapped Dynamic Indices, then, demands our careful appraisal of local conditions.

Interpretations

The following table, based upon scattered data covering the period from 1926 to 1937, suggests the world-wide applicability, and the kind of conclusions obtainable through the use, of the Dynamic Index.

Table I: Horticultural Data [8]

	Total Area, 1937, in hectares (000 omitted).	Neutral Point, per cent. (approx.).	Dynamic Index (percentage of plants non-bearing) 1937.
Grape vines:			
France (1936) . .	1511	4½	4
Germany . . .	82	11	10
Algeria (1936) . .	396	6	0
Syria	57	12	13
California (wine grapes)	71	7	4
Olives:			
Syria	90	8	11
Date palms:			
Algeria . . .	7	22	22
Tea Plants:			
Java and Madura, European culture (1936) .	105	2	2
Coconut palms:			
Dutch East Indies, excluding Java and Madura (1936) .	42	25	30
Oil palms:			
Dutch East Indies, excluding Java and Madura (1936) .	79	10	14½

The differences between the neutral points of different species of plants reflect differences in longevity and in the number of years before bearing begins. Tea plants and grape vines, yielding harvests after two or three years and growing to a great age, need a smaller proportion of young plants to replace them than such trees as date palms, which begin to yield fruit only after five to ten years from the time of planting.[9] The regional contrasts in neutral points for grape vines are doubtless explicable on the basis of differences in environment or in the methods of cultivation.

Thus, under the optimum conditions of France, stability is maintained with only 4½ per cent. of young vines, while in the marginal areas of Germany 11 per cent. is required.

A comparison of the Dynamic Indices for the year represented shows that the French and German vineyards were nearly in equilibrium, with a very slight decline perhaps in progress ; Syria was undergoing a slight increase ; Algeria, with virtually no young

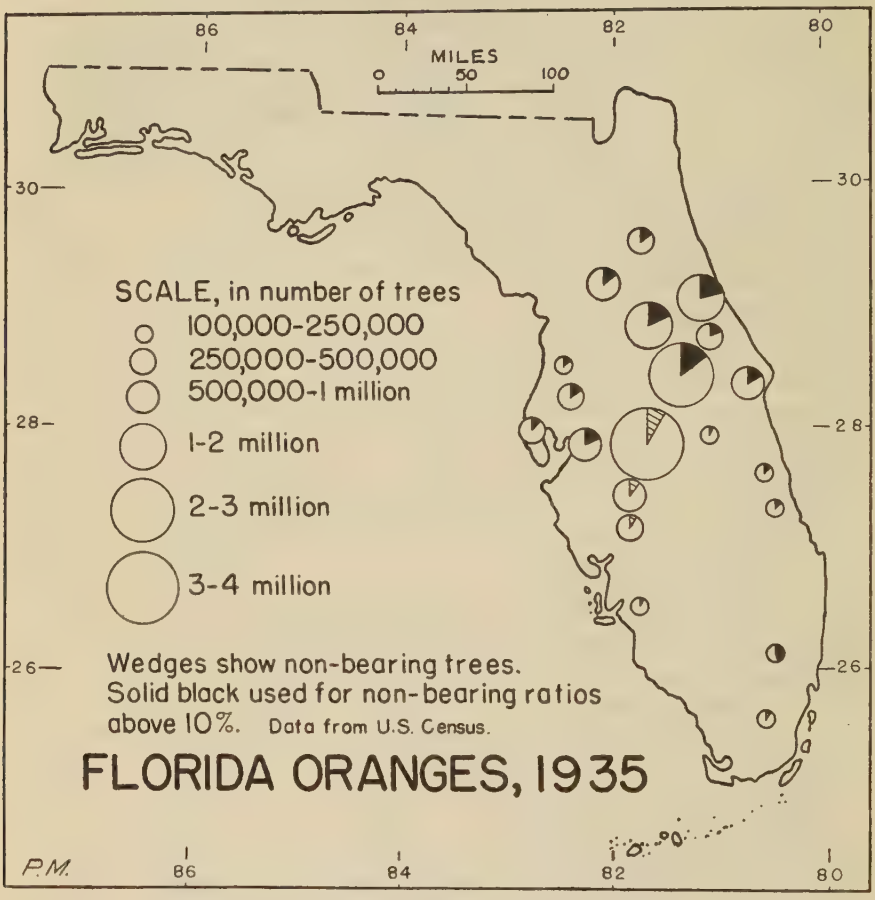

Fig. 2. Dynamic Index map for oranges in Florida, 1935.
State total, 15,432,050 orange trees ; Dynamic Index, 13.

vines, would be expected to show a declining acreage ; California, too, had insufficient young vines to maintain the existing acreage. Javanese tea groves had reached approximate equilibrium, but considerable increases in bearing groves of oil and coconut palms were indicated for the " outer " Dutch East Indies.

In general, an unusually large Dynamic Index may signify rapid expansion : a true pioneering development or the transition

to a more intensive form of land utilisation, as in the southern Texas citrus district. On the other hand, it may denote permanently precarious natural conditions, such as frost or drought at environmental margins, necessitating large replantings to maintain the orchards. Finally, it may be the result of extensive replanting due to some recent exceptional disaster, such as a hurricane or a rare killing frost. A small Dynamic Index may be expected in an old-established district of favourable environment (the French vineyards) ; in districts where growers have given up the struggle against permanently unfavourable conditions and are allowing the

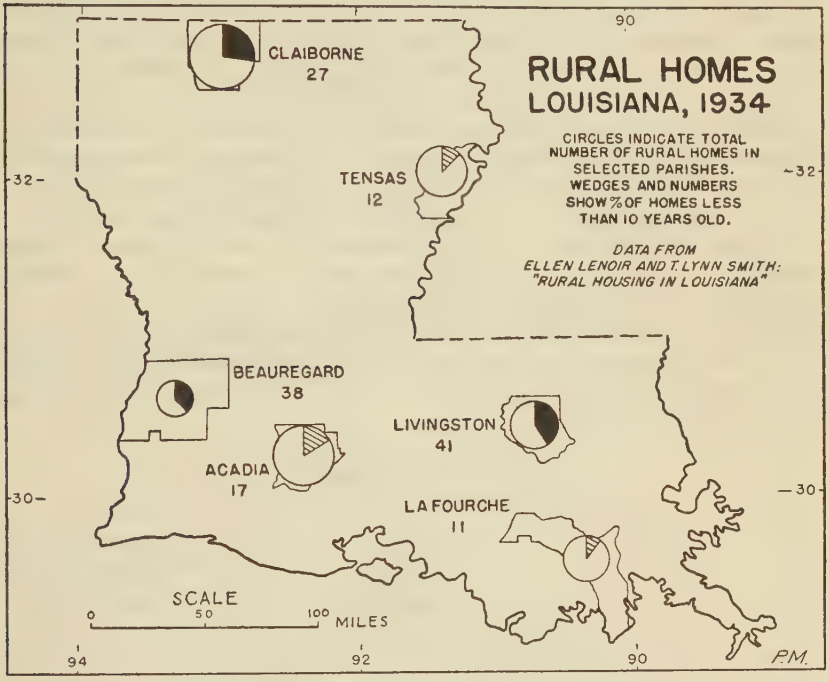

Fig. 3. Dynamic Index map for houses in Louisiana, 1934. Average six-parish Dynamic Index (percentage of houses less than ten years old), 23.

orchards to die out ; and, sometimes temporarily, during times of low crop prices. The use of the Dynamic Index can be of considerable value in directing the attention of the investigator towards critical spots and relationships in regions under consideration.

Other Applications of the Dynamic Index

Ephemeral agricultural products, such as grain or potatoes, which live for less than one year, do not lend themselves to analysis by direct application of the Dynamic Index technique. The use of the index can, however, be fruitfully extended to any reasonably durable elements of the cultural landscape. A grainfield may

look the same whether it has been cultivated for three years or fifty ; but the age of the farm buildings or machinery may yield a clue to trends.

Fig. 3 illustrates the application of the method to rural homes in Louisiana. The total number of rural houses and the percentage of them less than ten years old have been mapped for each of six representative parishes, using statistics obtained from a Government Survey.[10] Striking regional contrasts are apparent, with percentages of new homes ranging from 11 to 41. The three lowest indices occur in the fertile alluvial lands of the Mississippi delta, and are associated with relatively stable, early-developed cotton and sugar-cane production. The three highest indices occur in the " piney woods " uplands, and are associated with a pioneering type of development, in which small farms have recently been established in forest clearings following lumber operations. Longevity of houses may be a contributing factor to the index differences : the houses of the delta may be somewhat more substantial, with a lower " neutral point," than the pioneer houses of the woods.

Table II indicates the application of the Dynamic Index technique to livestock. The index used is obtained by dividing the number of head of livestock less than one year old by the total number of livestock in 1937. On the whole, livestock indices tend to be more stable than orchard indices, since production of new individuals is a more regular occurrence among livestock than among orchard trees.

Table II : Livestock [8]

	Total Number, 1937 (000 omitted).	Neutral Point, per cent. (approx.).	Dynamic Index (percentage of animals less than one year old) 1937.
Cattle :			
Scotland . . .	1,253	21	20
England and Wales .	6,761	16	19
Canada . . .	8,840	23	23
Denmark . . .	3,084	25	25
U.S.S.R. . . .	45,844	23 (?)	29
British India (1936) .	124,480	29 (% " calves ")	28 (% " calves ")
Sheep :			
Scotland . . .	5,843	31	34
England and Wales .	13,740	30	36
Horses :			
Scotland . . .	146	5	5
England and Wales .	859	7	6

The pronounced upward trend for sheep and the moderate upward trend for cattle in Great Britain indicate success for the British programme of increased home production.[11] Since the Dynamic Index for sheep and cattle is exactly at the neutral point in Denmark and Canada, a state of equilibrium has been reached there. Russia is evidently expanding her herds, while those of India are nearly stable.

Conclusion

The present paper, an initial, primarily methodologic statement, will perhaps raise as many questions as it answers. Projects are now under way for the application of the technique to detailed regional studies of American orchards, where the process of trial and error, with frequent readjustments of plantings to suit natural and cultural conditions, is still strongly at work. It would be interesting to see, through a detailed Dynamic Index survey, to what extent British and Continental orchards have reached a semi-permanent state of equilibrium.

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A fine annotated digest, showing the importance of historical background for urban geography, is given by :

M. Aurousseau, " Recent Contributions to Urban Geography : a Review " : *Geogr. Rev.*, vol. 14 (1924), pp. 444-455.

Some illuminating examples of the application of the historical geographical method are :

R. Blanchard, Grenoble : *Étude de géographie urbaine* (1911). " Edinburgh Number " : *S.G.M.*, vol. 35 (1919), pp. 281-330. (See p. 281 for P. Geddes' statement of principles.)

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ANTARCTIC HISTORY : A REPLY TO PROFESSOR W. H. HOBBS

By R. N. Rudmose Brown

In a lavishly illustrated and profusely documented monograph * Professor Hobbs has surveyed the history of discovery in that area of the Antarctic which is generally known as Graham Land, but sometimes as West Antarctica. Professor Hobbs prefers to call it the American Sector, probably because his main theme appears to be that the original discovery of continental land in this area was made by an American and, sad to say for Professor Hobbs' impartiality, that most British explorers of the area were impostors who deliberately falsified their statements and fabricated their charts. In spite of the assiduous care with which log books, volumes and charts have been examined in several countries, Professor Hobbs would seem to have approached his study with a bias in favour of America and in opposition to Great Britain. While the nationality of the discoverer of Antarctica is of no consequence, it is of value to establish the historical accuracy of events.

The first subject of contention concerns the discovery of the Antarctic Continent, apart from off-lying islands. In February 1819, Smith discovered the South Shetland Islands : that is not disputed. The discovery soon brought other sealers to the area, and in December 1819 the brig *Williams*, with W. Smith as master and E. Bransfield, Master, R.N., as commander, sailed from Valparaiso to examine this new land. The log of the voyage is lost, but two accounts have been published. The best known but obviously incomplete account is by the surgeon of the brig, Dr. Young, and appeared in the *Edinburgh Philosophical Journal* (vol. iv., 1821). The second was discovered by the late Dr. W. S. Bruce [1] in the *Literary Gazette*, 1821.[2] It is anonymous, but is said to be based on a log kept on board the *Williams*. Lieutenant-Commander Gould [3] suggests that it may be the work of Midshipman T. M. Bone, R.N. In any case it bears a nautical flavour. Lastly, Bransfield's discoveries were published as an Admiralty Chart in November 1822.

Young's vague account, lacking in precise detail, records " a gulf nearly 150 miles in depth." This has often been taken to indicate a penetration of the Weddell Sea which Bransfield seems to have made. But from the account in the *Literary Gazette* it clearly applies to Bransfield

* " The Discoveries of Antarctica within the American Sector, as Revealed by Maps and Documents." W. H. Hobbs, *Transactions of the American Philosophical Society*, Philadelphia, New Series, xxxi., i., January 1939. Page numbers in parentheses refer to this monograph.

Strait, and his implication of land to its south (for surely a gulf has land behind it) is certainly a reference to part of the Graham Land peninsula. Bransfield made this voyage in January and February 1820. Hobbs accepts Young's rambling account, but not the obvious deduction as to land. On the other hand, he discards (p. 37) the article in the *Literary Gazette* and considers the chart of 1822, although signed by Bransfield, to be a fake. His chief argument against the anonymous article seems to be that it contains statements in regard to new land which Young in his article did not make. The *Literary Gazette* article mentions the discovery of Tower Island in latitude 63° 29′ S. and longitude 60° 34′ W., and reports that "land was undoubtedly seen in latitude 64° and trending to the eastward." Later, on his way to Elephant and Clarence Islands, Bransfield, according to this account, sighted and fixed Mount Bransfield, on what he called Trinity Land. Gould has plotted Bransfield's route from this account and from charts in the Admiralty, on which at least part of it appears, and leaves us in no doubt of Bransfield's discoveries in January and February 1820. Hobbs' criticism that Young would never have omitted the discovery of new land (although we believe that Young did imply it) comes rather weakly in view of his exoneration of Palmer for making no mention of his discovery of land in his *official* log (p. 21). In any case Young was a layman with little appreciation of navigational detail. And Hobbs does not explain how the anonymous writer in the *Literary Gazette* could have imagined Mount Bransfield approximately in its true position. So much for the *Literary Gazette.*

Next the Admiralty Chart (1822) showing *The New or South Shetland seen in 1819 by Willm. Smith, Master of the Brig "Williams," Surveyed by E. Bransfield, Master, R.N., in 1820.* This incites Hobbs' wrath. There is no ship's track shown, the signature is only doubtfully genuine, and the names are in a different script. Does Hobbs think that Admiralty Charts generally include tracks of navigators, and does he believe that most masters complete their own charts rather than sign the navigator's version ? The charges against the veracity of this map are too lamentably weak in foundation to merit further notice.

These varied criticisms of Bransfield's discoveries and of the documents related thereto pave the way for Hobbs' contention that the American sealer, Nathaniel B. Palmer, discovered the mainland of Antarctica in November 1820, that is to say, ten months later than Bransfield's voyage. Palmer Land, which Hobbs has found in a map published in 1821,* was the land which Palmer sighted from afar in November 1820, or possibly in January 1821. That he did sight land need not be disputed, although in his log he strangely failed to mention it, and his brother is quoted as writing that the discovery was in the "latter part of January or first part of February 1821." [4] There can, however, be no reasonable doubt that Palmer's sighting of land, probably to the south of Orleans Channel, was subsequent to Bransfield's discovery of Trinity Land. So great is Hobbs' enthusiasm for Palmer that he even suggests that in 1821 Palmer had discovered the Seal Islands (Inaccessible Islands), which Bransfield and Smith had visited in February 1820,[3] and had perhaps sighted in mirage the South Orkneys (p. 24).

* This was a school atlas by W. C. Woodbridge, published at Hartford, Conn., and the first edition seems to have been dated September 1821. A school atlas can scarcely be accepted as documentary proof of Palmer's precedence in discovery, even if the date were not subsequent to both Bransfield's and Palmer's discoveries.

Among these early sealers one of the most enterprising was James Weddell, at one time a master in the Royal Navy and later the commander of the brig *Jane* of Leith. Hobbs' strictures on Weddell are threefold and relate to Weddell's own account of his voyages, which is accompanied by a chart showing his tracks.[5] First, he complains that since Weddell's chart of the South Shetlands marks no track on the south of the islands, he was never on that side and his claim to have surveyed the islands is false : that, in fact, Weddell's map is a mere copy of Powell's map made in 1821 and 1822.[6] Hobbs fails to notice that the track on the chart ends in December 1821, on the east of the South Shetlands, and begins again on January 30th, 1822, on the west. Quite obviously Weddell has omitted the zig-zag boat routes among the islands during his survey. How else are the two tracks to be reconciled and the missing seven weeks to be explained ? A comparable boat survey of the South Orkneys was undertaken in January 1823 by Weddell's mate, Matthew Brisbane, and a similar gap in the ship's track appears on the chart around the South Orkneys.

In the second place, Hobbs complains that to the south of the South Shetlands Weddell uses Bransfield's outline of the mainland and Bransfield's name of Trinity Land instead of Palmer Land. Weddell never claimed to have seen this land, and he clearly took it either from the Bransfield map of 1820, in which the South Shetlands were confused with continental land, or from the Admiralty chart of 1822.[7] In any case he had no reason to use Palmer's name for Trinity Land. Thirdly comes Hobbs' principal charge, that Weddell never sailed south into the Weddell Sea (Sea of George the Fourth), and that the whole story of reaching latitude 74° 15′ S. belongs " to the realm of fiction." Here Hobbs reaches a crescendo of bitterness without a scrap of evidence to substantiate his charge. His contention is that the Weddell Sea is " never navigable except within variable belts close to the shores of the Antarctic continent, has never been navigated in open water and never at all in the central region " (p. 44).

Only some seven or eight ships have ever attempted to enter the Weddell Sea. Their experience provides scanty data on which to generalise.[8] Of the five that have reached a high latitude, one, *Endurance*, was caught and crushed ; one, *Deutschland*, was caught and drifted, eventually reaching safety ; and one, *Scotia*, was caught and escaped in a few days by the skill of her navigator. It is undoubtedly a dangerous sea, owing to the circulatory currents carrying heavy ice and bergs, and the west coast is probably always blocked except in the north. The eastern side, however, is probably often open. Weddell went south in about longitude 30° W. and north in longitude 30-40° W. It is true that later ships found the open water further to the east ; both *Endurance* and *Deutschland* drifted, locked in the ice, in the western half where Weddell found open water. On the other hand, the *Scotia* reached latitude 72° S. in open water and without difficulty in 1904 across the middle of the Sea. In latitude 70° S. she was running free under sail alone, with only a few distant bergs in sight. Further, it is erroneous to assume that Weddell saw no ice in this Sea. In latitude 68° 28′ S., " ice islands were so numerous as almost to prevent our passing." [5] For fifty miles this continued. Hobbs overlooks the vagaries of pack ice in all polar seas : there are good and bad years and good and bad periods in any year. A continuance of southerly winds would

tend to clear the pack from the Weddell Sea, or a southward spread of the Westerlies to the north of the Sea might have a similar effect. At the better known opposite end of the world the good and bad ice years around Spitsbergen are well known ; and perhaps Hobbs has forgotten the remarkable absence in 1922 and especially in 1936 of pack from the East Greenland area, a coast generally bulwarked with pack ice. Melville Bay (Baffin Bay) is generally " open " in June, but about four times a century it is still ice-covered in August. Weddell was lucky, and luck is a great factor in navigating polar seas. There is not a vestige of justification for doubting his word.

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OBITUARY

Harry R. G. Inglis, F.R.S.G., F.S.A.Scot.

It is fitting that some reference should be made in the *Scottish Geographical Magazine* to the loss sustained by the Society through the death of one of its most active members, the late Harry R. G. Inglis. His father, Robert Inglis, became partner of Mr. James Gall, printer and publisher, and later married the granddaughter of his partner, daughter of the Rev. James Gall, by whom he had two sons, Harry being the younger.

Harry's education was at Oliphant's well-known school, at Craigmount and Dr. Bryce's Collegiate, interrupted by a sojourn in the Riviera with a tutor as the result of an attack of rheumatic fever. He served his apprenticeship under Mr. Andrew Elliot, and on his father's death, although only eighteen years of age, he, with his brother, carried on the work of the world-famed firm of Gall and Inglis.

He became a member of the Royal Scottish Geographical Society in 1917, was elected a Fellow thereof next year, a member of Council in 1919, convener of Finance Committee in 1925, and Vice-President in 1935. As convener of the Special Committee for the Exhibition of early maps of Edinburgh in the spring of 1919, he achieved a success which bore lasting fruit in the issue of the invaluable " Edinburgh " number of the *Magazine* for that year ; while his labour as editor of *The Early Maps of Scotland*, and his personal contributions to that work, cannot be over-estimated.

His death is a heavy loss to the Society—even more to personal friends. Intensely interested in his own work, eager, humbly eager, to be helped in his own researches on Bridges in Scotland, Engravings after the Hon. John Elphinstone, etc., etc., he was equally ready to help other searchers. Nor can we forget the Cyclists' Vade-mecum, the inimitable "Contour Book," which made Gall and Inglis a household name to all lovers of the wheel.

In his home, in his office, in the Library, or at a Livingstone Club dinner, it was a privilege to be near him. Our loss is emphasised by the sudden call to his brother, almost before the grave had closed over him.

C. B. B. W.

REVIEWS OF BOOKS

EUROPE

Extracts from the Records of the Burgh of Edinburgh, 1642-1655. Edited by Dr. MARGUERITE WOOD. Edinburgh: Oliver and Boyd Ltd., 1938. *Price* 21*s.*

Some seventy years ago the Scottish Burgh Records Society began to publish a series under this title, and in thirteen years produced five volumes—1403-1589—complete with index. These volumes contain what one may call the marrow of the records of the Town Council, with additional smaller matter concerning Provosts, Councillors and others, as also charters, etc., and they afford an immense amount of information on subjects of municipal, historical and social interest. The last volume was issued in 1882. Thereafter the Council Minutes slept a dusty sleep in their strong room in the City Chambers, save when some venturesome searcher dared to intrude to disturb them.

But some few years ago the question was raised by Bailie, later Provost Sir Thomas Whitson, of the town's taking up the thread. The suggestion met with the hearty approval of the Town Council; and, under the skilled guidance of Dr. Marguerite Wood, City Archivist, and the aegis of Sir Andrew Grierson, Town Clerk, and his successor, Mr. David Robertson, LL.B., several volumes have been produced, the last bringing the work down to the year 1655.

In these volumes the *ipsissima verba*, the racy vernacular, of the Minutes are quoted, giving absolute certainty as to what the Clerk minuted, while frequent explanatory notes and illustrative references to contemporary and other sources throw a general light on the whole. Many writers, such as Maitland in his great *History of Edinburgh* or Robert Chambers in his *Domestic Annals of Scotland*, have drawn from these original wells; but here, to vary the figure, the treasure-house is laid open for everyone who will enter and "pick up gold and silver." We owe, and gratefully acknowledge, our very great debt to our Town Clerk and his archivist for these and other volumes, and await with confidence and expectation the appearance of the new addition which is in hand.

C. B. B. W.

The Story of Inverkeithing and Rosyth. By the Rev. WILLIAM STEPHEN, D.D. Edinburgh: The Moray Press, 1939. *Price* 5*s.*

This is essentially an abridged edition, although brought up to date, of the author's previous "History" of the same area. Although most of the parish of Rosyth has been part of Dunfermline burgh since 1911, it is properly included in a history of Inverkeithing, since the two parishes had previously been united for some three centuries.

Dr. Stephen's work is the fruit of prolonged research, carried out during his

forty years' ministry at Inverkeithing. He deals fully with the geography of his subject, and with ecclesiastical and educational matters, as well as with trade and commerce. A section is devoted to the Grey Friars' Hospice at Inverkeithing, which has lately been restored by the Town Council. There are final chapters on North Queensferry and the Ferry Passage, in which Dr. Stephen brings out that the first turnpike across the Ferry Hills to Inverkeithing, Kinross and Perth was constructed, over an old line, in 1753 ; while the present Great North Road, at a lower level, followed some twenty years later. Again, between 1800 and 1810 there was much widening and regrading of the latter highway, apparently in connection with the extensive ferry improvements of that period. Roy's map of 1747-55 and Ainslie's of 1775 are reproduced, and an appendix deals with local place-names. A. J. B.

Caithness in the Eighteenth Century. By JOHN E. DONALDSON. Edinburgh : The Moray Press, 1938. *Price 7s. 6d.*

Caithness differs widely from the rest of the Highlands, consisting mostly of a flat and fertile plain. It was cultivated at an early period, with the result that during the eighteenth century the natives exported grain to Edinburgh, London, Holland, Denmark and Norway. The natives, mostly of Scandinavian origin, took no part in the Jacobite risings, with the result that, while dire poverty prevailed in the rest of the Highlands, the Caithness folk were living in comparative comfort.

This volume of 199 pages deals with the social and economic life of the inhabitants in the eighteenth century. The information is obtained chiefly from letters and other documents in the possession of the Sinclairs of Mey. These documents—hitherto unknown to the student of history—relate to the period between 1600 and 1800, and furnish valuable information on matters cultural, commercial and domestic. The author has consulted, in addition to the Mey collection, the publications of the Viking Society and the MS. history of Caithness, dated 1735, and now in the possession of the Public Library at Wick. The volume is a valuable contribution to the history of this portion of the Scottish Highlands. J. M.

In Famed Breadalbane : The Story of Antiquities, Lands and People of a Highland District. By the Rev. W. A. GILLIES. Perth : The Munro Press Ltd., 1939. *Price 15s.*

"Breadalbane" means simply the upland of Alban (Scotland). The boundaries of this extensive district have never been defined, but may be taken as extending from the junction of the river Lyon with the Tay to the watershed at Carndroma, west of Tyndrum. It includes Ben Lawers—the third highest mountain in Scotland (3984 feet)—and the whole basin of the Upper Tay.

The author states that this volume is the result of twenty-six years of research during his residence in this historic part of Scotland. He says it began with his own parish, but that he found it necessary, for a connective history, to extend his investigation to the whole of the district from Aberfeldy to Tyndrum. A glance at the preface will show that every available source has been consulted. Prehistory begins in this district with the Stone Age, the Bronze Age, standing stones and cup-marked stones, of which many illustrations are given. This is followed with a reference to the Roman period, as shown by the great fort at Fortingall. The departure of the Romans was followed by the incoming of the Scots, who eventually conquered the Picts or Caledonians and gave their name to the country. A brief account is given of the early Celtic Church and of the present Church. The Lairds and their doings from 1475 to 1717 are dealt with, followed by an account of the Earls, from the first in 1717 to the present Earl, the ninth in succession. The last two chapters explain the personal and place-names of the district.

The volume is beautifully illustrated throughout and a very good map by Bartholomew finishes one of the best histories that has been written of any

district in Scotland. Mr. Gillies has rendered valuable service to the antiquarian, the historian and the ecclesiastic. J. M.

The Abbeys of Scotland. By G. Reid Anderson. London : James Clarke and Co. Ltd. *Price 7s. 6d.*

The plan of this book is an excellent one : the author has selected twenty-four ruined Scottish abbeys, of which he gives a brief historical account followed by a list of the main features likely to interest the visitor. For comparative purposes a description is given of life at the Benedictine abbey at Fort Augustus, in a chapter which is particularly informative and helpful.

The illustrations, mostly by Mr. Robert M. Adam, are extremely good ; the architectural details are also excellent. But the same cannot be said of the historical matter attached ; apart from the controversial attitude the author adopts, which is surely unnecessary in a book of this type, there are a great many inaccuracies of spelling and of fact. To the first class belong the references to Aitan (for Aidan, p. 15) and to the Rev. James Copper (for Cooper, p. 46) ; of the second type are, for instance, the account of Mary Queen of Scots, who left Scotland for ever in 1568, looking up the Royal Mile for a sight of the Bonny Earl of Moray, who was murdered in 1591, and whose father was Mary's contemporary (p. 50) ; or again, when James VI is made to confirm a charter in 1488 (p. 132) and to have a brother, the Duke of Ross (p. 92). There is, also, a good deal of purely conjectural material which Mr. Anderson turns into fact. A. M.

The Land of Britain. Part 79. *Middlesex and the London Region.* By E. C. Willatts, Ph.D. London : Geographical Publications Ltd., for the Land Utilisation Survey, 1937. *Price 4s.*

This report, by the Organising Secretary of the Land Utilisation Survey, is on a larger scale than most of its fellows. It conforms to (or sets) the standard plan of such reports : History of the Survey, the Geographical Background, Land Utilisation categories, and the Land Use Regions. There is an additional chapter on the land utilisation of Middlesex in the past.

The area under review extends beyond the counties of London and Middlesex but is much smaller than the geological London Basin, being the districts covered by four sheets of the One-inch map (106, 107, 114 and 115, Popular Edition). The limits are obviously of no geographical significance, but the area is a convenient one to handle and of exceptional interest. There is a wide range of geological formations and of soils, the relief, although of no great magnitude, is intricate, and the climate is characterised by drier conditions and warmer summers than most parts of these islands. The description of the geographical background is competent, though the chief interest lies in the later chapters.

Of the vast collection of facts assembled and discussed, it is possible to review only briefly the broadest features. The growth of the largest urban group in the world has obliterated or buried under an artificial and sterile crust the natural features of the central region, which occupies 800 square miles, or 24 per cent. of the combined counties of London and Middlesex. Outside this continually expanding core, the haphazard and diverse development of natural potentialities has produced, from an area of originally almost undifferentiated woodland, interrupted here by heath and there by marsh, the twenty-eight Land Use Regions distinguished by Dr. Willatts. There are a few small areas of more or less natural vegetation left intact, on account of poor soil or unsuitable topography, which have in some cases preserved a traditional status of common land through periods when more desirable commons were enclosed. The bulk of the agricultural land is permanent grass, a reflection of predominantly heavy soils and an immense demand for milk, which is now far in excess of any possible local supply. The lighter soils are still arable land. Associated with the expansion of the town are the development and migration of various intensive forms of production, formerly carried on in such places as Chelsea and Kensington, and

now represented by the market gardens, nurseries and glass-houses of the Thames market-gardening plain, the Lea Valley, the south-west Essex and the north-west Kent market-gardening regions.

There are numerous exceptionally clear maps and considerable attention has been paid throughout to changes of utilisation during the last century. The author is to be congratulated on providing so concise and coherent a guide to a multitude of diverse facts. His book will undoubtedly stimulate others to take up the study of problems that lie beyond the scope of an L.U.S. report.

K. H. H.

The Verge of Lakeland. By W. T. Palmer, F.R.G.S. London : Robert Hale Ltd., 1938. *Price* 7*s.* 6*d.*

The arc of country which Mr. Palmer describes extends from Morecambe Bay to the head of the Solway Firth and it includes the valleys of the Lune and Eden together with the intervening Shap and Howgill Fells. It has nothing to do with Lakeland, except in so far as those serrated summits on the skyline improve its distant views, is less spectacular and more historic, and to some of us more attractive because less well known.

Mr. Palmer is at his most original in dealing with the high hills and outlying villages, where in his boyhood he collected by word of mouth customs and legends current a hundred years ago. He regards all water with the eye of a fisherman (not to say of a poacher), and is misleadingly modest about his nocturnal exploits by bog and fell. The carrier's cart, which Mr. Palmer regards as an anachronism in Westmorland and north-west Yorkshire, is still on the road and still to be depended upon in other parts of the county.

West Country. By Henry C. Warren. London : B. T. Batsford Ltd., 1938. *Price* 8*s.* 6*d.*

With an abundance of the fine photographs associated with this series (" The Face of Britain "), this volume will charm many and disappoint others. Some will find it echoes their memories of happy days : others will vote it incomplete because their own favourite corner of the West Country has been omitted. Yet on those very grounds we welcome it : inclusion and omission are both pleasing : inclusion of many lovely places and omission of those we fain would keep for ourselves. It is a relief to find this volume does not tell tourists of many hallowed corners of Devon and Cornwall. The book is good value, with its 169 photographs and rambling comments, but surely a sketch map would have enhanced its charm and usefulness. R. N. R. B.

Irish Holiday. By Dorothy Hartley. London : Lindsay Drummond Ltd., 1938. *Price* 7*s.* 6*d.*

In Praise of Ulster. By Richard Hayward. London : Arthur Barker Ltd., 1938. *Price* 21*s.*

Ireland on £10. By Sydney A. Clark. London : Ivor Nicholson and Watson Ltd. 1938. *Price* 5*s.*

There is some witchery about the Dark Rosaleen which makes her lovers fluent writers. All of these books to some extent catch the lilt of the language, and with it something of the half-wild, endearing atmosphere of the country. Indeed atmosphere is all we do get from Miss Hartley, whose course we should not like to have to plot on the map even one week after putting down her book. Taking as her guide, and quoting from it as from the experience of a contemporary, the itinerary of Giraldus, a medieval monk of Wales, she went to Ireland determined to find a wild and lovely country, and find it she did. Giraldus is at times a little tiresome, but there are unusual photographs and individual line drawings to enliven what is already a lively narrative.

Mr. Hayward, who wears his Irishry a little self-consciously, has let himself go to the length of 370 large and closely set pages, which in our opinion was about

a hundred pages too many for a single book. He knows Ulster, in which he includes Tirconnail, from not one journey but a lifetime's residence, and for him, and for us too if we have the patience, every stone has its history and a good many of them their pre-history as well. Easy to read and easy to skip, this is a book which one should keep by one to dip into for reference and should have been completed by an index. The illustrations, by Humbert Craig, are somehow a little disappointing in that their subject cries aloud for colour.

Mr. Clark's budget includes the northern counties, of which Mr. Hayward makes so much, as a " Forbidden Interlude " only. He is more concerned with ways and means and his book includes planned tours and a map ; not a large-scale map, but still A Map, which is adequate in proportion to the bulk of the text and the scale upon which its illustration has been permitted.

Sardinian Studies. By members of the Le Play Society. Edited by W. G. Walker. London : The Le Play Society, 1938. *Price 2s.*

In compiling this slender volume the editor was well advised not to attempt a comprehensive study. The result is to be regarded as complementary to a good guide-book knowledge and the " Itinerary " of the Le Play group making these observations is indeed the least attractive section. The content is three studies and two shorter appendices (The Solid Wheeled Cart and the Zinc Mines of Monteponi). The first sketch, simply expressed by Mr. W. H. Bennett, exemplifies from Sardinia geological processes common to the Mediterranean. In the central and most substantial study, Mr. W. G. Walker treats in detail and with a well-developed sense of continuity the settlement of Sardinia as reconstructed from the archaeological evidence. His account is illustrated by three maps of the island in Nuragic, Punic and Roman times, and pre-eminence is naturally given to the Bronze Age culture of the *nuraghi.* Thirdly, the Rev. R. W. Stopford deals with the development of ecclesiastical architecture. The use of capitals and italics confuses rather than elucidates the text and one or two of the diagrams have unfortunately been over-reduced. Otherwise the expression is lucid and the material of sufficiently sustained interest.

Tirol, Vorarlberg, Westliches Salzburg, Hochkärnten. Leipzig : Karl Baedeker, 1938. *Price* RM. 8.50.

Austria on £10. By Sydney A. Clark. London : Ivor Nicholson and Watson Ltd., 1938. *Price 5s.*

Let's go to the Dolomites. By Marion L. Davidson. London : Frederick Muller Ltd., 1938. *Price 5s.*

Each of these three books, although published only last year, contains (the second one in a Preface only) references to the events of March 1938. In Baedeker's *Tirol* the prices have actually been altered throughout from Austrian schillings to Reichsmark. As " Good wine needs no bush," it is unnecessary to say that this guide-book is wholly admirable. British readers may be glad to know that it is printed in Latin, not Gothic, type.

Austria on £10 argues that the incorporation of the country in Greater Germany is beneficial to British tourists from the financial point of view, and that for two reasons. The sum named does not of course cover the cost of the journey there and back, but it is maintained that it would suffice for a stay of from twelve to fifteen days provided the traveller were content with simple accommodation in modest inns or private houses. The book, which is illustrated with a map and various drawings, may be recommended as a travelling companion since it gives many practical hints and describes the chief places of interest.

Let's go to the Dolomites is perhaps best read in the country itself, as it is full of detailed directions for walks and motor excursions. It is illustrated by some beautiful photographs and contains a sketch-map, an index, and a Table of Heights. There is also a chapter on flowers. It is a pity that more trouble has not been taken over the actual writing, and the date 1765 on p. 50 seems odd.

M. E. N.

Sweden, Ancient and Modern. Edited by Rolf Grauers, for the Swedish Traffic Association. London : George Allen and Unwin Ltd., 1938. *Price* 5*s.*

The author of this volume of 246 pages gives a brief but clear account of the early history of Sweden and its modern development. The tract of land forming the south and eastern portion of the Scandinavian peninsula comprises 173,296 square miles and has a population of six and a quarter million, which includes 34,000 Finns and 6500 Lapps. The climate is regulated, according to the author, by the Gulf Stream ; for while 25,000 square miles lies within the Arctic Circle, it does not suffer from Arctic conditions. Geologically the northern portion is chiefly granite, gneiss and eruptive rocks, but the south is younger. As in most countries, there is a drift of population to the towns. Whereas in 1850 only 10 per cent. lived in towns, by 1936 the proportion had increased to 35 per cent.

The writer claims " almost complete absence of illiteracy in Sweden " and " high cultural standards " (p. 109). The country depends chiefly on its forests, which cover over half its area, and most of the wood is pulped for paper-making. Sweden is the second largest exporter of pulp and paper in the world. The working of iron ore, of which the country has one of the greatest reserves, is another industry. The abundance of water power enables Sweden to develop electricity cheaply, and this again helps the manufacture of matches, glass and china, ball-bearings and electrical generators.

The volume is well written and beautifully illustrated. J. M.

Return to the Baltic. By Hilaire Belloc. London : Constable and Co. Ltd., 1938. *Price* 12*s.* 6*d.*

This is the story of Mr. Belloc's return, after a lapse of forty-three years, to Baltic lands—to Scandinavia and to Poland. Those who seek in it a guide-book will straightway be disappointed : those who seek stories of travel in these lands will not find them : instead, we have a book containing Mr. Belloc's opinions about wine, Southern culture and the North, and the Catholic Faith, with, in occasional thin layers, a mention here and there of Jelling, Aarhus, Copenhagen, and so forth. To the Belloc " fan " this is doubtless fascinating : the ordinary reader may, however, tire of the continual harping upon the debt of Northern Europe to the South, when " rude Paganism was conquered by the Faith."

The main feature of the work is that Mr. Belloc consistently over-states his case ; also, his beliefs concerning anthropological dogmas of the present day are surely inadequate (p. 60), and his judgements about *Beowulf* have not been held by any scholar of repute for many years (pp. 65-9). Finally, the proof-reading has not been careful : there are frequent differences of spelling in place-names between one page and another, and between the illustrations and the text, which, though of minor importance perhaps, are nevertheless irritating to the reader. A. M.

Nordosteuropa ; Völker und Staaten einer Grosslandschaft. (" *Macht und Erde,*" Heft 11.) By Dr. Werner Essen. Leipzig and Berlin : B. G. Teubner, 1938. *Price* RM. 1.20.

The author of this brief survey defines North-East Europe as a triangle the points of which fall at the towns of Magdeburg, Baku and Chabarowa. This area includes the Baltic States, the North German Plain (east of the Rivers Trave, Elbe and Saale), and Russia as far as the Urals and the Caspian Sea. Dr. Essen's treatment of the subject is mainly historical. He discusses briefly the development of the region from the days of the great migrations (*Völker-wanderung*) to modern times. He points out that whereas before the War North-East Europe was dominated by two Great Powers—Germany and Russia—since the peace settlement those Powers have been separated by Poland and a number of small states. The author considers that " the German element in

North-East Europe has always been the guardian of order and justice—the true Europe," and that it is desirable that Germanic and not Slavonic influences should predominate in that region. W. O. H.

ASIA

Palestine Unveiled. By Douglas V. Duff. Glasgow : Blackie and Son Ltd., 1938. *Price* 8*s.* 6*d.*

Going Home : a Modern Jew Returns to Palestine. By Ernst Harthern. London : Jarrolds Ltd., 1938. *Price* 12*s.* 6*d.*

Mr. Duff's journey to Palestine was prefaced by a deep study of the Bible as a historical document and of other chronicles of the Holy Land. Not quite convinced of the truths of Christianity, he set out to make a study on the spot of the dim and shadowy history and to find out, if possible, the essential Man in Christ. There is no doubt that his journey had a profound effect on him, and although the book is of little geographical value the reader is taken on a historic and very interesting journey. Mr. Duff has his own experiences to tell of meetings with Arabs and Jews and of their relations to one another ; but not everyone will agree with his views on British methods of keeping the peace in Palestine.

The second volume gives a much fuller picture of life in Palestine to-day, treated as it is with a deeper knowledge of the past and of the circumstances attending the present condition and future development of the country. The author is a German Jew who has a Gentile wife and two children baptised as Christians. His visit to the country was taken with a view to studying on the spot the suitability or otherwise of the land as a future home for his children. In the main, the volume is concerned with the rapid development of agriculture, transport and industry in the country wherein Jews of all nationalities and all grades of culture have literally laboured hard to win success. Giving point to all this, the author has introduced brief but brilliant biographies and tragic stories surpassing all imagination. The dominant note is one of quiet yet firm belief that here lies a haven of refuge and of peace for many of the author's harassed and de-nationalised co-religionists. J. Y. E.

Through Lands of the Bible. By H. V. Morton. London : Methuen and Co. Ltd., 1938. *Price* 7*s.* 6*d.*

In this, his third book of travels in the Near East, Mr. Morton starts at Alexandretta and progresses east and south through Syria and Iraq to Ur of the Chaldees ; then retracing his steps, he passes through Syria and Palestine to Egypt, where he visits many centres of Coptic worship, which are vividly described—particularly those in the Wadi Natrûn—travels through the Wilderness of Sinai, and ends his journey in Rome by visiting the spots associated with the Apostles.

Although without the universal appeal of following in the footsteps of the Master or of St. Paul, this book maintains nevertheless a remarkably high standard of writing. Mr. Morton is as fluent as ever, and occasionally almost surpasses himself in brilliant descriptive writing and in his use of the *mot juste.* One's only grumble is that occasionally he does not say enough of, for instance, the shrine of St. Simeon Stylites, of which more than one picture would have been intensely interesting. A. M.

The Wild Asses : a Journey through Persia. By W. V. Emanuel. London : Jonathan Cape Ltd., 1939. *Price* 12*s.* 6*d.*

The author relates the experiences of twenty-two British and Austrian undergraduates, who, under the auspices of the National Union of Students, undertook a journey through Persia and Afghanistan in 1936. Passing first through southern Russia, the party traversed northern Persia, by Teheran to Meshed, and Afghanistan to Herat. Returning, they made a detour to Shiraz, and again visited Teheran on their way to join a steamer on the Caspian Sea.

The descriptions of historical places and scenery are well written, and comments on the people and customs are impartial and interesting. As the route was quite off the beaten track and the countries visited are in a state of transition from an old way of living to a new one, this book supplies a useful commentary on present conditions. It gives in addition an entertaining account of the party's difficulties on the road. W. O. L.

Durian. By Noel Wynyard. London : Humphrey Milford at the Oxford University Press, 1939. *Price* 10*s.* 6*d.*

To understand the implication of this title one should have lived within, say, ten degrees of the Equator, where the durian fruit flourishes, for only those who have realised its luscious flavour can abide the malodour which has to be endured by those who eat it. The author uses this fact to indicate what she found of both light and shadow when living under the tropical conditions which the White Man's Burden entails.

Mrs. Wynyard tells of a comparatively short and chequered stay in the north of Siam, where she lived in a teak forest of which her husband was superintendent. Her experiences were varied by visits to Sumatra and different places in the Malay States, but had unfortunately to end in a Mandalay hospital as a prelude to her voyage home. The book is well written in a good descriptive style, with cover map and photographs. It shows considerable powers of observation, although we gather that the writer had to endure an unusual amount of sickness and ill-health. This must perforce restrict the outlook of even the most optimistic soul who has to call the jungle " home," and yet we gather that however monotonous and " un-English " her life may have been, Mrs. Wynyard found in it that compelling allure which is indicated by the references to the flavour of the durian.

We commend the chapters on teak forestry, also those on the use of elephants, as giving interesting information ; but would prefer to advise those women who may be looking forward to life in this part of the Far East not to expect to repeat some at least of the experiences through which Mrs. Wynyard has passed so courageously. G. B.

In Search of Soviet Gold. By John D. Littlepage and D. Bess. London : George G. Harrap and Co. Ltd., 1939. *Price* 8*s.* 6*d.*

The author of this interesting book is an American mining engineer who spent ten years in Siberia in the service of the Soviet Government, mostly as the expert adviser to the Gold Trust, the department in whose care was the development and working of the extensive Russian gold industry. Mr. Littlepage must have a knowledge of Siberia since the Revolution more extensive than that of any other foreigner. He had no interest in politics and appears to have confined his attention to his business. He does, however, tell us much from his own observation of the " liquidation " of the kulaks, their harsh treatment when evicted from their homes and transported thousands of miles, of the power of the dreaded G.P.U. in industry, and of the peoples of the country in which he has travelled 200,000 miles.

It is interesting to note that Mr. Littlepage thinks that there is a great deal of sabotage in Russia, even among intellectuals, and that not all the appalling shootings were wholly without justification ; but it is interesting to note also how one appears in time to become, not callous, but at least inured to the suffering of helpless peasants during the period of transition. S.

AFRICA

South Africa : a Planned Tour of the Country To-day. By A. W. Wells. London : J. M. Dent and Sons Ltd., 1939. *Price* 10*s.* 6*d.*

This is a delightful book which it is difficult to lay down. There is scarcely a dull page in all its four hundred. Guide-books are often attempted which

combine practical information with literary grace : Mr. Wells has succeeded in achieving this feat. He is the most friendly and leisurely of companions ; what with historic references, human stories, and out-of-the-way incidents, he makes interesting every place he describes. South Africa, he says, is like no other country ; and this guide-book, we may say, is unlike any other. We have the authentic note of Africa with its matter-of-fact civilisation and with its magic and mystery.

The routes described are carefully planned and nothing is missed. A sheaf of coloured maps, photogravure illustrations, a table of historic events, a list of things to see, a bibliography and a good index add to the completeness of the book, which is admirably produced by the publisher. W. P. L.

My Tanganyika Service, and some Nigeria. By Sir Donald Cameron. London : George Allen and Unwin Ltd., 1939. *Price* 10*s.* 6*d.*

Sir Donald describes his term of office as Governor of Tanganyika, in which territory his name will always be gratefully remembered, particularly by the natives. He established the system of native administration of which he had had experience in Nigeria, where it had been introduced by Lord Lugard for the first time in any British colony. It is the model for all British tropical colonies and has been an outstanding success. Sir Donald was the first Governor of Tanganyika to travel over the whole of the country under his rule, and his personal contacts with both his own officers and the native chiefs have been of inestimable benefit.

Of outstanding interest at this time are Sir Donald's remarks on the subject of the German claim to Tanganyika. He is not one of those who insist that the Germans had, before the War, proved themselves incapable of ruling a native race with justice ; but his reasons for refusing now to hand over a native territory to the Germany of the present day would appear to be irrefutable. The question of the ex-German colonies is a burning one and may take a serious turn any day. To those interested we strongly recommend the last few pages of this book. Apart from this, the book is full of interest as showing in detail the work of a Colonial Governor who has to build from the foundations up. S.

Jungle Trader. By H. R. Taylor. London : Jarrolds Ltd., 1939. *Price* 8*s.* 6*d.*

Mr. Taylor was a young salesman in a Regent Street shop which he deserted to become the assistant of a British trading company in Liberia. Had he not told us this we might have imagined him a professional author. He has an excellent and breezy style, while his matter is of unfailing interest. He joined a trading company whose name was notorious in earlier days for the miserable pay and treatment meted out to their white staff, and his earlier experiences in a junior capacity were enough to daunt and discourage anyone. Mr. Taylor persevered, and rose rapidly to responsible positions where he obviously made good.

Liberia is a republic misgoverned by the descendants of freed slaves from America, but the natives of the country are Krooboys, among the finest of the African races. Away from the coast they are still cannibalistic savages. Slavery, disguised, is rampant, and Mr. Taylor tells gruesome stories of the kidnapping and cruel treatment of natives. Not being under the control of a civilised Power, Liberia is a state where the old " palm oil ruffian " type of trader still flourishes, and in this book, which rings true, we get a comprehensive account of life on this part of the coast. S.

White Hunter. By J. A. Hunter. London : Seeley, Service and Co. Ltd., 1938. *Price* 15*s.*

The author of this book, whose name is the same as his profession, tells the story of his shooting big game in East Africa. It differs in no way from the stories

of other big game hunters in East Africa, of which so many have recently been published. Notwithstanding the author's long experience, we do not think that others with equal experience will subscribe to his generalisations about the habits of some of the big creatures of the wild. There are a number of very good illustrations, mostly from photographs by notabilities who have been shooting under the guidance of the author. S.

AMERICA

Fever, Famine and Gold. By Captain E. Erskine Loch. London : William Heinemann Ltd., 1939. *Price* 12*s.* 6*d.*

The title of this volume gives an indication of the character of its contents. The author, a retired British army officer and an experienced explorer, read in New York a legend regarding the lost mines of the Incas and was fired with the idea of searching for them. The expedition which resulted developed into one under responsible auspices properly equipped for geographical and ethnological research, and in this respect fulfilled its purpose. But few notes on the scientific side of the work are recorded here. It is a detailed description of the progress of the party over cloud-covered mountains, through low-lying forest lands and on jungle rivers, with all the familiar stories of transport difficulties, sickness, delays and other hardships.

The territory explored and mapped was a section of Ecuador lying roughly between Quito and the frontier of Peru, including the eastern Cordillera, the Oriente, and the Rivers Curaray and Mapo. The party travelled 2280 miles by foot, horseback, canoe and raft. Apart from the work of observation and collection, and of finding a direct route through the mountains to the Oriente, the motive which lured the expedition on was the gleam of gold, and at the close of the book the reader is left with the suggestion that the sources of that enormous wealth which brought ruin to the Incas may really have been discovered.

W. P. L.

British Guiana Papers : Scientific Results of the Oxford University Expedition to British Guiana in 1929. London : published for the Oxford University Exploration Club by Humphrey Milford at the Oxford University Press, 1938. *Price* 21*s.*

Here in collected form are some thirty republished papers on the results of the Oxford University Exploration Club's expedition to British Guiana in 1929. The story of this expedition has already been told, and Mr. Hingston's narrative from the *Geographical Journal* (vol. 76, 1930) is included. The aims were biological and were amply fulfilled. More than half the papers deal with the flora and the others chiefly with insects and birds. Ecology is less noticeable than taxonomy, but the collection is useful and certainly is a record of assiduous work. R. N. R. B.

Canoe Errant on the Mississippi. By Major R. Raven-Hart. London : Methuen and Co. Ltd., 1938. *Price* 10*s.* 6*d.*

Major Raven-Hart writes unaffectedly of a thirty-seven-day cruise in a collapsible canoe from Hannibal to Baton Rouge, during the summer of 1936 and thus immediately before the disastrous floods of 1937. The narrative which might have been a monotonous one of swimming and camping on sand-bars is pleasantly overshadowed by memories of Mark Twain and the Federal *v.* Unionist conflicts of which British history takes such small account. The similarity to Egypt, enhanced by names like Memphis and Cairo, is a fact which the environmentalist may like to remark, and the isolationism of life between the giant levees of the Mississippi is seldom realised. Practical contact with the river training works of the M.R.C. at Vicksburg is engrossingly described, and there is an abundance of sketch-maps upon which some indication of the direction of flow would have been helpful.

Canadian Frontiers of Settlement. Vol. II. *History of Prairie Settlement.* By ARTHUR S. MORTON. "*Dominion Lands*" *Policy.* By CHESTER MARTIN. Toronto: The Macmillan Company of Canada Ltd., 1938. *Price* $4.50.

This is in every sense an impressive volume, with its 571 large pages, clearly printed, its adequate supply of maps and diagrams, and its some 35 pages of closely-set index. It consists really of two books, as is suggested by the title: the first dealing with the story of the settlement of the prairie region from the Red River to the Rocky Mountains, and the second and larger with the complicated plans of the Dominion in dealing with the settlement of that vast area for which the responsibility lay upon the Dominion Government and not upon the Provinces.

In judging the book one must remember that it has been written for Canadians by Canadians, and also that it is a book of reference rather than a book to be read, although the earlier portion, the *History of Prairie Settlement*, may be read and enjoyed by those who have even a slight acquaintance with the romantic story of the Red River and the struggle which was to determine whether the fur trader or the farmer should rule the new West. The advent of the railway, the deciding factor, seemed to raise more difficulties than it settled. The story is an interesting one and is well told.

The second part of this monumental work is less easy to understand and quite impossible to summarise; but for those whose interests lead them in that direction we can imagine no better guide through its intricacies than is provided in "*Dominion Lands*" *Policy*. This is in every sense a book worthy of its great subject. J. G.

AUSTRALIA AND NEW ZEALAND

Free and Easy Land. By FRANK CLUNE. London: Angus and Robertson Ltd., 1939. *Price* 10*s*. 6*d*.

The land referred to is Queensland, and the efforts of the author, who has made several journeys through the State, are directed towards presenting an amusing account of his tours and to giving particulars of the various hardy pioneers who have opened up the country. There is not much of geographical value, however, except in the records of past discoveries and in the development of industries. The book would have been better without its frequent references to other works by the same writer. The map inside the covers gives a fair indication of what may be expected from the writing and is a debasement of cartography. We learn nothing from the text about the Barron Falls, above Cairns (where good beer is made according to this map), and waterfalls are rare in Australia. The map further tells us that Free and Easy Land was *discovered* and explored by Clune between the years 1917 and 1937. This is a little hard on all the early men: there were maps of Queensland in 1886 which, although inaccurate in parts, were what Australians would call "good enough." W. L. C.

Unclimbed New Zealand. By JOHN PASCOE. London: George Allen and Unwin Ltd., 1939. *Price* 16*s*.

There are many in the climbing fraternity abroad who believe Mount Cook to be New Zealand's only worthwhile mountain; an opinion readily drawn from the mountaineering literature of New Zealand which is confined almost entirely to the Hermitage and Mount Cook district. It is pleasing, therefore, to find in John D. Pascoe's book an account of work that is being done to open up the excellent climbing fields that exist in other parts of the South Island. The peaks in these districts are not so high as those of the Cook group, rarely, in fact, exceeding 9000 feet, but it is not the technical difficulties (themselves not negligible) so much as their difficulty of access, which has enabled many 8000 footers to withstand the repeated efforts of well-equipped parties. Chasm-like gorges, impenetrable bush, a confusion of passes, ranges and valleys through which the explorer has to thread his way with the help of the most approximate

of maps—all these are excellently described. But greater than all these difficulties is the unfordable river. As Mr. Pascoe says, " Rivers present more danger to New Zealand alpine travellers than all the avalanches, rock-falls, snow-slides and crevasses put together." And certainly statistics show only too clearly that in New Zealand drowning is the mountaineer's death.

It must be said, however, that Mr. Pascoe has rather over-emphasised the dangers and hardships of back-woods climbing. To him all days seem to have been wet days, all rivers flooded and all peaks shrouded in mist. This is hardly fair to New Zealand. Bad weather among the mountains of the world is traditional, but in New Zealand it is at any rate no worse than elsewhere. Being too obsessed with its difficulties, Mr. Pascoe seems somehow to have missed the spirit of the country.

Some historical chapters are included. Mr. Pascoe is an authority on such matters, and his tales of the bush-rangers in the old gold-rush days, and particularly his account of Samuel Butler's early life in the setting of *Erewhon*, make interesting reading.

The book is illustrated with a host of excellent photographs, mostly from Mr. Pascoe's own camera, which give a good representation of the beauty of valley, peak and pass which is the heritage of the New Zealand mountaineer.

E. H. S.

THE EAST INDIES AND OCEANIA

Borneo Jungle. Edited by Tom Harrisson. London : Lindsay Drummond Ltd., 1938. *Price* 15*s.*

This book is the record of an expedition by eight young men from Oxford (average age twenty years) to the jungles of Borneo in the year 1932. The editor, Tom Harrisson, writes entertainingly, if also caustically, on youth expeditions in general, on the popularity of Arctic as opposed to tropical exploration, on the difficulty of financing an expedition if collecting is not to be the main objective, and of the indiscriminate slaughter of birds and animals while museums are still cluttered with numerous unidentified species.

Under the title " Borak and Belles," John Ford contributes a chapter on native dancing, games and social life ; borak, a liquor brewed from rice, supplying the stimulus for such activities. Apparently the borak party was a great success. C. H. Hartley deals with the grim subject of head hunting, and Patrick M. Synge gives a fascinating description of some of the curious and beautiful orchids and pitcher plants, and of the native designs as revealed in tattooing and in carving. In the concluding chapter, Edward Shackleton describes his ascent of Mount Mulu, the highest peak in Sarawak.

It is an attractive and well-illustrated book which deserves the attention of the serious geographer as well as that of the devotee of arm-chair travel.

D. G.

They Call Them Savages. By Aletta Lewis. London : Methuen and Co. Ltd., 1938. *Price* 8*s.* 6*d.*

The " them " of the title refers to the natives of eastern Samoa : who it is that calls them savages cannot be discovered from a perusal of the book. It matters little—so palpable a misnomer is it.

The author, an Art teacher in Australia, was commissioned to make some pictures of Samoan life. " Stick to American Samoa. Don't go to the British group. There's not the good feeling there between the natives and the whites that there is in the American islands " was, alas, the perfectly sound advice given her. So Pago Pago became her headquarters and the U.S. Navy officials there her generous and friendly hosts.

This young English artist's book presents, with frankness and humour, a reliable picture of Samoan life. It is admirably and profusely illustrated by her own drawings ; and if the " Louisa " of the frontispiece hardly corresponds to the description of the same person on p. 33, and if Miss Lewis herself seems a little uncertain about the spelling of such words as coca-cola and Clara Bow,

the volume contains no other matter with which the most critical reviewer could find fault—unless it be the strange word " plimsol " appearing on p. 78.

The portraits of Mauga and Tufele are superb. D. B. C.

GENERAL

This is Our World. By KURT LUBINSKI. London : Hodder and Stoughton Ltd., 1938. *Price* 15*s.*

One almost regrets that Mr. Lubinski has written this book. There is enough material for half-a-dozen books, which obviously the author could have written with much pleasure and enlightenment to the reader. His wanderings, apparently over a period of years, cover a large part of the globe, but with what object they were undertaken he does not tell us, except in one instance when he was commissioned to take to Haile Selassie a magnificent gramophone specially made for that unfortunate monarch. This led to extensive travel in Abyssinia, but his errands took him also to Iceland, Siberia, America, Spain, Turkey, North Africa, Holland and Austria. In one volume he does little more than sketch them. He appears to have had access to or to have met almost everyone worth knowing, including Trotsky and Kemal Ataturk. His journey to Siberia especially, in a part of that vast territory which we are sure is unknown to Western Europeans, would have made a book of unique interest, and it is tantalising to be told so little when he must know so much.

We hope that Mr. Lubinski will devote a whole volume to some of the places mentioned in this book. He is able to hold the interest of his reader throughout and is never boring. The illustrations, from photographs of his own, are particularly fine and many of them without parallel. The book is a refreshing change from the usual travel story of to-day. S.

Peaks and Valleys. By F. S. SMYTHE. London : A. and C. Black Ltd., 1938. *Price* 12*s.* 6*d.*

It is a pleasure to turn to this volume of illustrations with explanatory text, and we laid it down with mixed feelings—of pleasure, admiration and dissatisfaction : pleasure in the photographs, admiration for the skill of the photographer, and dissatisfaction with our own poor efforts at photography.

The illustrations are mainly Himalayan, with a few of the European Alps, and are most varied in character. It is interesting to see that after visiting the high Himalayas, Mr. Smythe has been content to return to our own small Scottish hills and to show as the last illustration a picture of pine woods in Glen Affric.

A. H.

NATURAL HISTORY

Wild Animals in Britain. By FRANCES PITT. London : B. T. Batsford Ltd., 1938. *Price* 8*s.* 6*d.*

This is the book of a true field-naturalist, who understands the British mammals and has studied their habits and characteristics at first-hand. Lydekker, Millais, Barnett-Hamilton, not to mention the earlier Bewick or Gilbert White, have given us much information ; yet there is ample room for just such a book as this, since there remains a deal of ignorance about the ways of the seventy-five species and sub-species we have in Britain.

Miss Pitt corrects several false impressions, such as that the common shrew is a mouse, that our red squirrel hibernates, or that the wild cat can be domesticated. She does not believe that dogs and foxes cross, or that the stoat hypnotises a rabbit when the bunny appears to be paralysed and ceases to try to escape. She knows the deer too, and the bats (which few people realise are mammals), and, although the chapters on seals and whales are relatively short, the information given there is at first-hand and seems to us accurate. She does not mention all the whales, as, for instance, *Balaena biscayensis*, the small bowhead, of which specimens have

been shot round our coasts after this whale had for years been presumed to be extinct. The grey seal, which breeds on lonely islands in October, she has observed although perhaps not in all its moults. Very charming are the hundred most excellent photographs. W. L. C.

Wild Country. By F. Fraser Darling. London : Cambridge University Press, 1938. *Price* 10*s.* 6*d.*

This small but very beautiful book consists of a large number of the author's photographic studies of wild bird and seal life in an island in the Hebrides. Dr. Fraser Darling is not only an unusually expert photographer, as his pictures show, but also, judging from the accompanying letterpress, an understanding and sympathetic lover of his subjects. His photographs are exquisite.

A very interesting digression describes the ancient forests of Scotland eight thousand years ago, and how early and modern man has destroyed them. It will be news to most readers that, in the early industrial period of England when the woods in the south had been worked out, iron ore was sent to the Highlands to be smelted where wood was still plentiful. It is difficult to imagine our derelict Highlands as the scene of a once-busy iron industry. S.

I Know an Island. By R. M. Lockley. London : George G. Harrap and Co. Ltd., 1938. *Price* 10*s.* 6*d.*

Mr. Lockley might well have said that he knew several islands, for although his own particular island is Skokholm, off the Pembrokeshire coast, he has studied the ways of those who dwell on various islands as well as the ways of birds and seals. Grassholm, Ramsey, the Blaskets, the Fair Isle, North Ronaldshay, the Faroes and Heligoland come under special review. He keeps the " i " in Heligoland in spite of modern German usage, and, of course, it is the famous *fanggarten* of that island rather than fortifications which interest him. At the same time he gives much information about the manner in which the Germans have modified this crumbling and crowded little spot which we handed to them in exchange for Zanzibar in 1890.

In spite of the very great numbers of birds which migrate via Heligoland, the Fair Isle is the place for rarer species. It was here that the late Duchess of Bedford and the late Mr. Eagle Clarke made so many of their observations when it was established as a regular bird-watching station. He remarks that there is no Gaelic in the island, but one might as well expect Gaelic in the Scandinavian Faroes of the north. We are a little critical of one or two references : we do not like " plantycrubs " as the Shetland name for the small walled cabbage patches. They are cruives. Nor do we agree that the grey seal, when he submerges, makes a somersault. It seems to us that he makes a characteristic sideways splash, as he throws himself under water when he has seen a horrid-looking human being and is startled. He also has the habit of raising head and shoulders above the surface in an upright position, as the common seal never seems to do. Mr. Lockley's diligent search for the Fork-tailed Petrel is unrewarded till he goes north to the Westmann Islands. He does not appear to have tried North Rona.

This is a delightful book for the bird-lover, apart altogether from the special feature of the island life, the Robinson Crusoe existence of Mr. Lockley on his own Skokholm, or the filming of the gannets of Grassholm along with Professor Julian Huxley. W. L. C.

POLITICAL GEOGRAPHY

Elements of Political Geography. By Samuel Van Valkenburg. New York : Prentice-Hall Inc., 1939. *Price* $3.50.

A new text-book on a subject upon which there is plenty of information readily available is of value only if it to some extent replaces its predecessors by summarising the results of recent research and by giving up-to-date information. Professor Van Valkenburg has little fresh to offer when covering old ground. His notion that there is " a cycle in the political development of nations . . .

namely, youth, adolescence, maturity and old age" (p. 5) is neither new nor particularly helpful. But his work is up-to-date and contains not only adequate references to recent frontier changes—such as those of Germany in 1938—but also discussions of modern problems—such as the colonial demands of the "Have Not" powers. After discussing territorial changes in the world since 1900, and analysing conditions in France (as an example of a detailed regional study in political geography), Professor Van Valkenburg deals in turn with the physical, economic, human and colonial factors in the development of political communities. There are numerous useful maps and tables.

W. O. H.

Verhandlungen und wissenschaftliche Abhandlungen des 26. deutschen Geographentages zu Jena, 1936. Edited by Dr. ALBRECHT HAUSHOFER. Breslau: Ferdinand Hirt, 1937. *Price* RM. 9.00.

"The primary purpose of the new teaching in Geography is political" (p. 198 of the present volume). The review might fittingly end here. The constituent papers are arranged as a sort of *crescendo*: Geography as the foundation of *Raumforschung* and Regional Planning; Geography in Military Science; Geography of *Sudetendeutschtums*; the Importance of Space for the Development of Our People; Colonial Geography and the German Colonial Problem; Race and People as Material for Geographical Teaching. A very torrent of incoherent comment rises out of *Nationalsocialistische Erziehung im und an der deutschen Landschaft*. Fervent partisans rebuke the over-scientific: "National-Socialist thought denies the influence of environment . . . and with reason" (p. 117). This is indeed in contradiction of what the Leader says in his book, *Mein Kampf* (p. 208)!

A. S.

TRANSPORT

Die Strassen der Welt: eine Strassengeographie. By KARL KRÜGER. Berlin: Volk und Reich Verlag, 1937. *Price* RM. 4.50.

The author of this interesting book is fully justified in his contention that geographers and engineers have hitherto been each insufficiently in touch with the works of the other. Perhaps the civil engineer, deeply concerned with construction in a given locality, has not felt the need for generalisation regarding the regional relations of his work; while the geographer has too seldom made himself familiar with the engineer's technique to review the results with assurance. While historical geography has discussed the significance of great routes of the past, the economic and strategic importance of modern roads has been seriously neglected in geographical texts. "The Roads of the World," therefore, breaks new ground as a geographical treatise.

More than half the book is occupied with general aspects of road construction and maintenance the world over and with reference to past, present and future conditions. Attention is drawn to the unforeseen enthusiasm with which modern inventions are being greeted by millions of people whose material life hitherto has been at least as primitive as that of medieval Europe. In particular, the motor-car is an instrument of revolution in Asia, Africa and South America. Hence the importance throughout these lands of the creation or renascence of roads. The author has collected a vast amount of information regarding the feverish activities of road builders everywhere; yet statistics do not obtrude themselves. The aim is rather to set forth the causes that initiate, and the considerations that guide, the development of new road systems in lands of different geographical character.

The complexity of the subject is abundantly demonstrated: it concerns not merely engineers and geographers, for it obviously possesses many economic, political, social and psychological bearings. But this in itself is a valuable feature of the book and one which should arouse wide interest in a subject surely deserving more attention that it receives, since new roads are among the most prominent outward signs of the material progress of our age.

The general aspects are followed by separate accounts of the road types

and systems of India, the Far East, Soviet Russia, Africa and America, while the final chapter is devoted to the German *Reichsautobahnen* and the possibility of developing similar roads connected with these in other countries. The illustrations and maps form an essential feature, but some of the latter unfortunately have been over-reduced in view of the rough paper employed. The book merits wide publicity and an English translation would be welcome.

A. G. O.

EDUCATIONAL TEXT-BOOKS

Our Daily Bread : a Geography of Production. By Sir DANIEL HALL. London : John Murray, 1938. *Price* 6*s.*—A book about farming by Sir Daniel Hall arouses pleasant anticipations, and to this *Our Daily Bread* is no exception. Sir Daniel's enthusiasm for his subject at once communicates itself to the reader. When one comes to consider the book, however, in relation to the class-room, certain difficulties arise. It is a book which one would like to put in the hands of any young student of geography, but the price prohibits its use as a geography reader for most schools. Probably it would be placed in the school geography library, but here another problem arises. It ought to be read with a certain amount of advice or supervision, for otherwise much of it is misleading. For example, the diagram on page 26 shows production contrasts of wheat and flour in the form of loaves from the various countries of origin. The United Kingdom loaf is the largest ; yet there is no indication that much of the United Kingdom wheat never reaches the loaf but goes to feed stock. Again, the maps are of England and Wales, but the letterpress contains references to Scottish production. And yet I feel the geography teacher would like to use such a book, and by making lists of its weaknesses could guard against misunderstanding by skilful class teaching.

G. M.

This Modern Age. By F. C. HAPPOLD. London : Christophers, 1938. *Price* 5*s.*—Those who are too young or too busy to have made a detailed study of the complete background of modern times will welcome this book. The author is to be congratulated on the skilful way in which he clarifies the intricate maze of modern life. Sections dealing with the economic, political and social organisation of the world are introduced by a short historical survey and develop into such modern problems as banking, rates of exchange, raw materials, colonial government, dictatorships. Most of the things that influence our lives receive some attention—the Radio, the Press, the Cinema, town planning, machinery.

This book should be in every school library ; it has a high educative value, not only because of the information it gives, but because it should develop a realisation that the world is fundamentally a unit and that human co-operation is essential to human welfare.

The value of the book is enhanced by the clear and easily understood maps and diagrams of J. F. Horrabin.

S. C. F.

Physical Geography and Geology. By L. DUDLEY STAMP. London : Longmans, Green and Co. Ltd., 1938. *Price* 4*s.*—This book meets a long-felt want for a logical and concise introduction to general principles. It deals with the earth, weathering, volcanic activity, mountain building, climate, geomorphology, soil, vegetation, sea, a history of the earth and the physiography of the British Isles. The wording is simple, and every aspect is clearly illustrated by well-drawn diagram or excellent photograph. Use is made of geology, botany and zoology as necessary links in the interpretation of the subject. There is a freshness of outlook throughout, whether the author be dealing with an hypothesis as to the earth's origin or the classification of climatic regions. It will lighten the work of Higher Geography in the Senior School and be a very real aid to the first-year University student who must, at times, approach the subject without the necessary background.

M. G. L.

Harrap's Geography Picture Summaries. XX. *New Zealand : The Pacific Islands.* Selected by S. J. B. WHYBROW and H. E. EDWARDS. London : George G. Harrap and Co. Ltd., 1938. *Price* 1*s.* 4*d.*

OTHER BOOKS RECEIVED

List of Monuments (to 31st December, 1939). Prepared by the Commissioners of Works. Edinburgh and London : H.M. Stationery Office, 1939. *Price* 2*s.*

Geographischer Eigennamen. I. *Deutsch-Portugiesisches, Portugiesisch-Deutsches.* By A. J. Schmidt. Rio de Janeiro, 1938.

Handbook of Latin American Studies. A selective guide to the material published in 1937 on Anthropology, Art, Economics, Education, Folklore, Geography, Government History, International Relations, Law, Language, and Literature. By a number of scholars. Cambridge (Mass.) : Harvard University Press ; and London : Humphrey Milford at the Oxford University Press, 1938. *Price* 17*s.*

YEAR-BOOKS

British Health Resorts, Spa, Seaside and Inland. Edited by R. Fortescue Fox. London : British Health Resorts Association, 1939. *Price* 2*s.* 6*d.*

IV. Ukrainian Statistical Annual, 1936-1937. (Compilation.) Warsaw : Ukrainian Economic Bureau, 1938.

Egyptian Cotton Year-Book, 1937-38. Edited by Armand Lakah and Co., Alexandria, 1938. *Price* 10*s.*

Annuario Dell' Africa Italiana e delle Isole Italiane dell' Egeo, 1938-39. Rome : Instituto Fascista dell' Africa Italiana, 1939. *Price* 20 *lire.*

Canada, 1939 : The Official Handbook of Present Conditions and Recent Progress. Published by authority of the Hon. W. D. Euler, Minister of Trade and Commerce. Ottawa : Dominion Bureau of Statistics, 1939. *Price* 25 *cents.*

The South American Handbook, 1939. Edited by Howell Davies. London : Trade and Travel Publications Ltd. : Sixteenth Annual Edition, 1939. *Price* 3*s.* 6*d.*—There is little to add to previous commendations of this indispensable handbook to Latin America in all its varied aspects. It goes on increasing in size and in usefulness of the matter. In addition to full accounts of South American countries and Mexico and Cuba, briefer references are made to the British West Indies. W. P. L.

The Official Year-Book of New South Wales, 1936-37. By T. Waites. Sydney : Government Printer, 1938. *Price* 5*s.*

We are advised by the International Institute of Agriculture in Rome that its Library has taken over publication of the *Internationale Bibliographie des agrar-ökonomischen Schrifttums*, and will henceforward issue this list quarterly under the title *International Bibliography of Agricultural Economics.* The bibliography lists articles in all languages in periodicals as well as books. Contributions to the subject, which is generously interpreted as including, among other topics, types of rural dwelling, are grouped according to subject-matter, and, where the number of entries warrants, further subdivided according to States. All headings are repeated in French, English and German. Each title appears no more than once, however, so that while the student is certain of missing no major publication on any aspect in which he may be interested, it remains difficult to trace books or pamphlets whose incidental concern may be with his interest. The annual subscription, including postage, is 6s. 6d.

NEW MAPS AND ATLASES

EUROPE

SCOTLAND.—Ordnance Survey of Scotland.—Publications issued from October 1st, 1938 to March 31st, 1939.

Six-inch Full Sheets. Reprinted as Quarter Sheets. Price 2s. each. *Lanarkshire*—9A NW., 14 SW., NE., SE. *Linlithgowshire*—11 SW., SE., NW.

Six-inch Scale Maps (revised). Quarter Sheets with Contours in Red. Price 2s. each. *Lanarkshire*—2 SE. (1935), 7 NW. (1933-35), 8 NE. (1935-36), 10 NW., NE. (1934-35). *Dunbartonshire*—33 SE. (1935).

1 : 2500 Scale Maps (revised). With Houses Stippled and with Areas. Price 6s. 8d. *Angus*—53 : 4 (1937), 12 (1937). *Ayrshire*—17 : 8 (1937), 16 (1937), 18 : 5 (1937), 6 (1937), 10 (1937), 33 : 6 (1937). *Dunbartonshire*—22 : 2 (1937), 8 (1937), 23 : 5 (1937), 7 (1937), 9 (1937), 10 (1937), 11 (1937). Price 4s. *Angus*—53 : 11 (1937).

Geological Survey of Scotland.—Publications issued from October 1st to December 31st, 1938.

Vertical Sections. Scale Fifty Feet to One Inch. 22. *Illustrative of the Fife Coalfields* (Area III) *Dysart and East Fife* (One-inch Maps 40 and 41). Price 2s. 6d. Scale Forty Feet to One Inch. 24. *Illustrative of the Central Coalfield* (Area III) *Bo'ness and Linlithgow* (One-inch Maps 31 and 32). Price 2s. 6d.

Land Utilisation Survey of Britain.—Sheet 6, *Orkney Islands* (*Mainland*). Scale One Inch to One Mile. The Land Utilisation Survey, London School of Economics, Aldwych, W.C.2. Price 4s. (paper).

GREAT BRITAIN.—Map of Britain in the Dark Ages. (North Sheet.) Scale 1 : 1,000,000. Ordnance Survey, Southampton. Mounted on linen and folded, with letterpress. Price 5s.

The map is designed to represent the condition of the country during the years A.D. 450-850, and a variety of symbols have been employed and designed by their form to suggest the object denoted. The design on the cover is intended to represent the culture of the age. The Director-General expresses the hope that other map-makers will adopt the same symbols and thus establish a uniform symbol language.

The varied opinions as to who were the Broch builders seem to be sufficiently crystallised to enable Mr. O. G. S. Crawford and his assistants to state definitely that the Brochs were built by the Picts, who invaded Scotland from the north ; but if their view is correct it seems strange that no similar form of building is found in any other part of the world.

While the investigators have been hampered by the paucity of early records, they have managed to collect a large amount of valuable information.

GERMANY AND CZECHOSLOVAKIA.—*Philips' Hand-Map of Germany and Czechoslovakia.* Scale 1 : 4,000,000. Geo. Philip and Son Ltd., London, January, 1939. Price 6d.

ASIA

CHINA.—Scale 1 : 4,000,000. Sheet 34. Geographical Section, General Staff, War Office, London, 1926. Price 5s.

AFRICA

EGYPT.—*Authentic Imperial Map of Egypt.* Scale 1 : 1,000,000. In colour. Geo. Philip and Son Ltd., London, 1939. Price 2s. 6d.

AMERICA

ALASKA.—*Map of Alaska.* Scale 1 : 5,000,000. United States Department of Interior, Geological Survey, Washington, 1938.

Map of Goodnews District of Alaska. 18. Scale 1 : 250,000. United States Department of Interior, Geological Survey, Washington.

CANADA.—*Stanford's General Map of the Dominion of Canada and Newfoundland.* Scale 1 : 5,500,000. Edward Stanford Ltd., London, 1939. Price 7s. 6d.

UNITED STATES OF AMERICA.—*Topographical Survey.* Scale 1 : 62,500—*Washington, Mt. Rainer National Park*; *Missouri*, 1 sheet; *N. Carolina*, 1 sheet; *Alabama*, 2 sheets; *Florida*, 2 sheets; *N. Dakota*, 1 sheet; *Iowa*, 1 sheet; *Pennsylvania*, 2 sheets; *Michigan*, 1 sheet; *Ohio*, 2 sheets; *Illinois*, 4 sheets; *New Hampshire*, 2 sheets; *New York*, 2 sheets; *Maine*, 1 sheet; *S. Carolina*, 1 sheet; *Oklahoma*, 1 sheet; *California*, 1 sheet. Scale 1 : 31,680—*Louisiana*, 5 sheets; *Ohio*, 3 sheets; *Massachusetts*, 3 sheets. Scale 1 : 30,000—*Puerto Rico*, 3 sheets. Washington, 1939.

ATLASES

ATLAS VAN TROPISCH NEDERLAND.—Martinus Njhoff, N.V., The Hague, 1938. Price 16 gilders.

PHILIPS' FUNDAMENTAL SCHOOL ATLAS.—Edited by George Philip, F.R.G.S., and George Goodall, M.A. Geo. Philip and Son Ltd., London, 1939. Price 3s.

OXFORD SKETCH-MAP ATLAS OF WORLD GEOGRAPHY. By J. H. Stembridge. Oxford University Press, 1939. Price 2s. 3d.

Very useful summary maps covering the world by continents and countries, with seven pages of generalised physical factors and world distributions. Any one of them would provide the facts for a complete lesson or written description.

ADMIRALTY CHARTS

EUROPE.—*Strait of Gibraltar*, No. 142, Price 4s. 6d., December 1938; *Plans on the Coast of Cyprus*, No. 846, Price 4s. 6d., February 1939.

JAPAN.—*Tsurugi Saki to Yokohama*, No. 3548, Price 4s. 6d., October 1938.

PHILIPPINE ISLANDS.—*Cuyo West Pass*, No. 3820, Price 6s., November 1938; *Cuyo East Pass*, No. 3821, Price 6s., February 1939.

AFRICA.—*Mokambo, Mozambique and Conducia*, No. 653, Price 4s. 6d., December 1938; *Cape Sierra Leone to Turtle Islands*, No. 689, Price 6s., February 1939; *Sallutuk Point to Cape Sierra Leone*, No. 686, Price 4s. 6d., February 1939; *Alexandria Harbour*, No. 3119, Price 4s. 6d., December 1938; *Approaches to Alexandria and Abu Qir Bay*, No. 2681, Price 6s., November 1938.

FLORIDA.—*Plans on the coast of Florida*, No. 3684, Price 4s. 6d., February 1939.

CHILE.—*Plans on the coast of Chile*, No. 3078, Price 4s. 6d., December 1938; *Puerto Pan de Azucar*, No. 3071, Price 4s. 6d., December 1938; *Bahia Algodonales to Rado de Arica*, No. 3070, Price 4s. 6d., December 1938; *Plans on the coast of Chile*, No. 2987, Price 4s. 6d., December 1938; *Caleta, Totoralillo to Puerto Pan de Azucar*, No. 3072, Price 4s. 6d., December 1938.

WORLD.—*Telegraph chart of the World*, No. 3778, Price 6s., November 1938; *Index charts of Admiralty Sailing Directions*, No. Y, Price 1s., January 1939; *Index chart of Admiralty Lists of Lights*, No. Z, Price 1s., January 1939; *Gnomonic chart: South Atlantic and Southern Oceans (Curves for obtaining true bearings of Cape Town)*, No. 18B, Price 3s., November 1938; *Gnomonic chart: South Atlantic and Southern Oceans (Curves for obtaining true bearings of Stanley Harbour)*, No. 18C, Price 4s., November 1938.